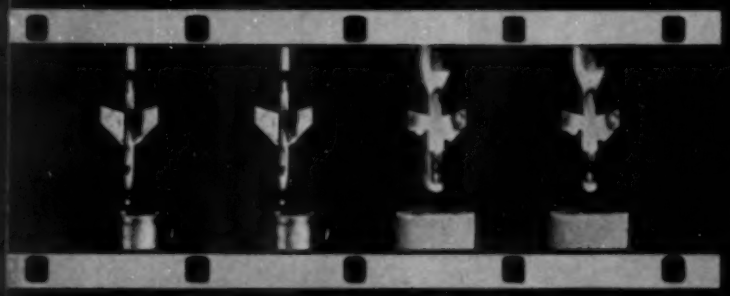
American Machinist

MARCH 10, 1958 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Where Metalworking is heading

A SPECIAL REPORT, page 113



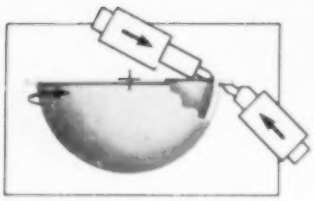
At Mach 7, heat shows up in .84 sec, spreads in 4 sec . . .

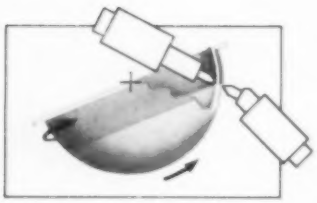
in 6.7 sec, right wing of stainless model burns off . . .

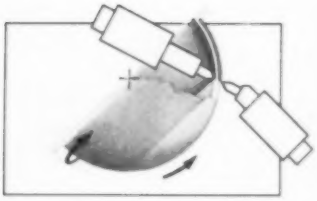
in 8.0 sec, left wing follows in test by NACA . . .

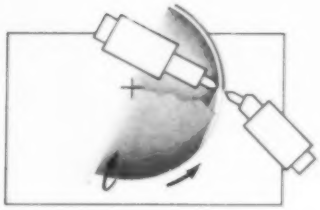
in 10 sec, hypersonic flight knocks out stainless steel.

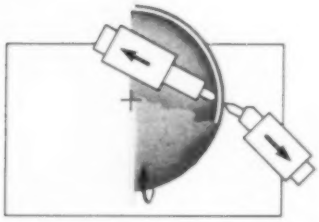
TOOL STEEL—the answer for hypersonic flight—see page 2











ALUMINUM HEMISPHERES

SPHERICALLY BORIZED

on I.D. and O.D. Simultaneously

Putting a precision finish on aluminum hemispheres is the job done by the Heald Model "S" Bore-Matic shown above.

These large hemispheres require stock removal from both the I.D. and O.D., maintaining desired hemispherical shape and critical wall thickness.

The work is rim-clamped in a rotating fixture which is arranged to pivot on a vertical axis at the center of curvature. Stationary opposing tooling, mounted on two hydraulically operated slides, bores and turns the I.D. and O.D. *simultaneously*, as shown by the simplified schematic drawings at the left. Size tolerance is held to ± .0005 on I.D. and O.D. for maintaining critical uniform wall thickness. A dial indicator permits checking finish size before removing work from the machine.

This is an interesting example of the ability of a Heald Bore-Matic to meet unusual precision-finishing requirements with important savings in time, effort and expense—another reason why it pays to come to Heald.

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD ®

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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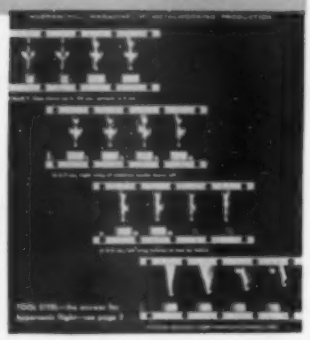
American Machinist chips



Thermal Barrier . . . You've heard talk of the problems of building planes for hypersonic flight that would withstand the heat involved. Our cover shows frames from a previously secret movie showing what can happen to a typical medium-speed supersonic aircraft. The National Advisory Committee for Aeronautics designed and built the model and conducted the test at the Langley Aeronautical Lab. The model was made of 400 series stainless steel and immersed in rocket exhaust of approximately 4000 F at 7200 ft per sec. This speed was actually Mach 2.7 but the test conditions simulated free flight at Mach 7 (seven times the speed of sound). The pictures were taken with a 16-mm Bell & Howell camera at 130 frames per second. The model lasted 10 sec.

Thermal Hurdle . . . The most promising material to hurdle this thermal barrier at the moment is our old friend hot-work tool steel. Fabrication and heat treatment require some adjustments when the switch is made from stainless to tool steel, and our lead article summarizes the results of work at Republic. See page 106.

Musical Chairs . . . Several familiar features turn up in unfamiliar locations in this issue. You will find our "News Report" pages starting on page 97, just behind the editorial. You'll find "Practical Ideas" on page 150, just behind "Talking Shop." "Names In The News" will be found on page 199, immediately following the new equipment section. All these changes are another step in our continuing effort to organize the magazine for your convenience. Once you get used to the changes, we think you'll find it easier to locate the features of special interest to you. At the same time we are able to increase the number of pages that close at the last minute to give you an even fuller account of late developments in metalworking.

What's Ahead . . . Our staff statistician, Doug Greenwald, has just completed a special projection to 1960 of the major components of the American Machinist Index of Production. You'll find this projection in the Special Report on page 113. There's a wealth of detail on capital spending in the future, the growth of research and development planning, and the production picture in 1960. The long-range view looks pretty good from here.

Coming . . . *AM* for Mar 24 will feature articles on the Moll flowing of metals, the scheduling of machine loads, coining, die lubrication, case hardening, and chemical milling.

Cover . . .

High-speed camera records failure of supersonic plane model in NACA test. See details at left.

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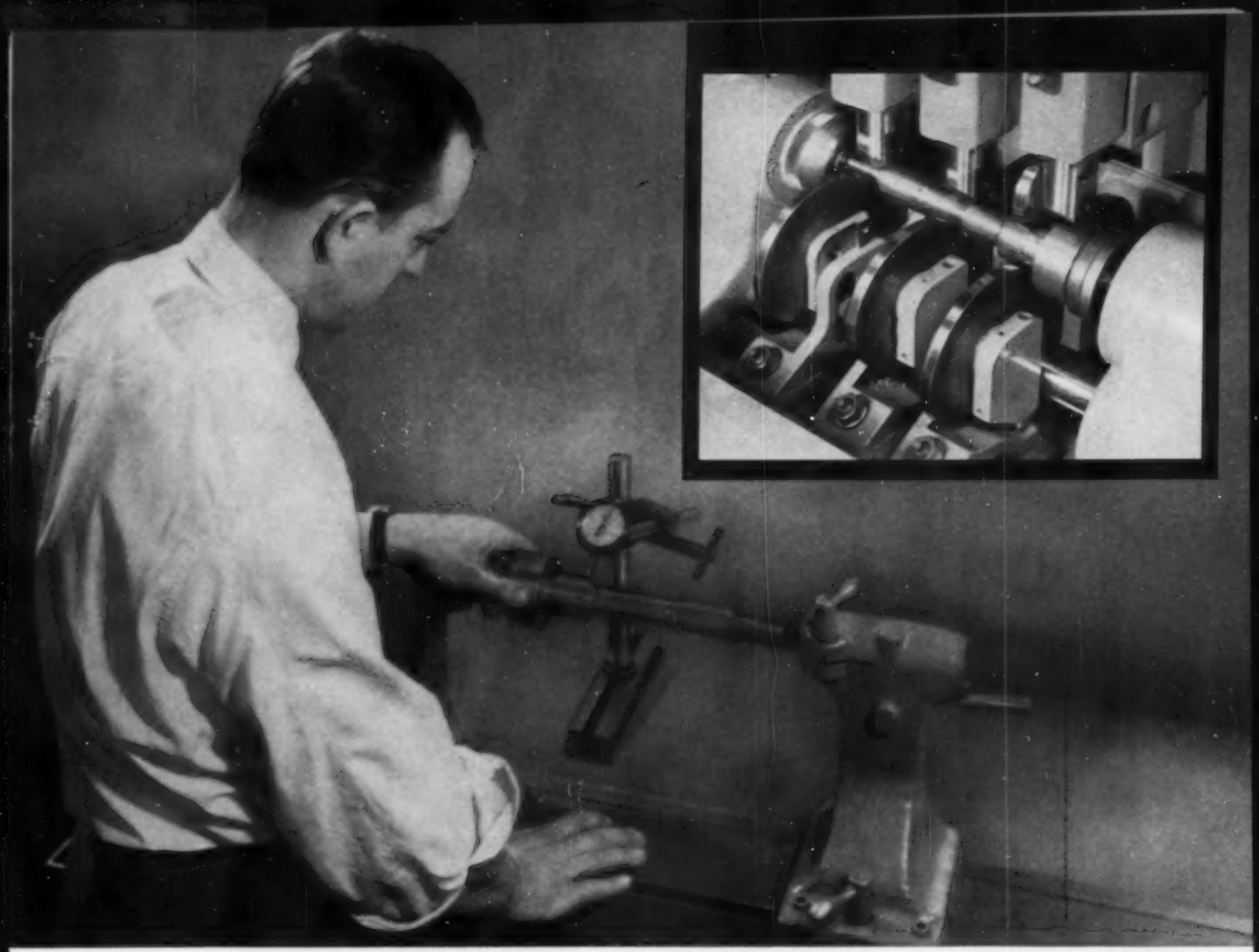


How this shaft was quenched and straightened *at the same time*

This shaft reads true because it was not allowed to distort during hardening.

The manufacturer used a Gleason No. 140 Rolling Quench Machine to straighten the shaft *while it was being quenched.*

Since cold straightening was completely eliminated, he saved valuable production time and expense.

The quenched shaft also has less residual stress.

With this machine you roll parts under pressure continuously as you quench them. The operator puts the hot part on the lower rollers and starts the machine.

From there on the operation is automatic. Rolling speed, pressure and oil flow have been pre-set to meet specifications.

The Gleason No. 140 Rolling Quench Machine is suited equally well to both small and large quantity work. It accommodates shafts $\frac{5}{16}$" to 4" in diameter, 6" to 40" in length, with integral cams or shoulders up to 8" diameter.

Tooling can be arranged to hold parts on diameters or centers. Unusual shapes can be handled with additional tooling.

Write for further information.

The Gleason No. 140 Rolling Quench Machine also handles multiple quenching of short shafts.

GLEASON WORKS

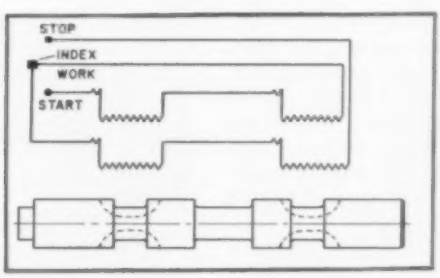
Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

AUTOMATIC MILLING CYCLE PERFORMS AN *ADDITIONAL* JOB

. . . Cincinnati No. 0-8 Combines Automatic Work Indexing with Automatic Milling

Ingenious tooling does more than facilitate a machining operation; it relieves the operator of onerous physical effort. Cincinnati Application Engineers are well acquainted with this fundamental, and it's quite evident in the tooling which they devised for the CINCINNATI No. 0-8 Automatic Milling Machine illustrated here. The machine is an automatic rise-and-fall style. It has the basic equipment capable of performing much of the operator's work . . . simple hydraulic system; automatic table and spindle carrier cycles; quickly interchangeable cycle selectors which control the sequence of events. ¶ The index fixture mounted on the table is a hydraulically actuated unit, connected to the machine circuit and controlled by the cycle selector. Automatic milling and indexing progress in planned sequence, with no effort on the part of the operator. Several slots are milled in each part, without removing it from between centers. And to reduce costs still further, several sizes and styles of parts are milled on this equipment. Interchangeable cycle selectors for the machine take care of the automatic cycle requirements for the entire family of parts. ¶ Quite likely, Cincinnati methods and new milling machines can save money for you. Cincinnati Engineering Service Specialists are ready to make the survey. Meanwhile you might like to have a copy of our 0-8 Automatic Milling Machine catalog. Write for publication M-1607-2. Brief specs in Sweet's Machine Tool file.



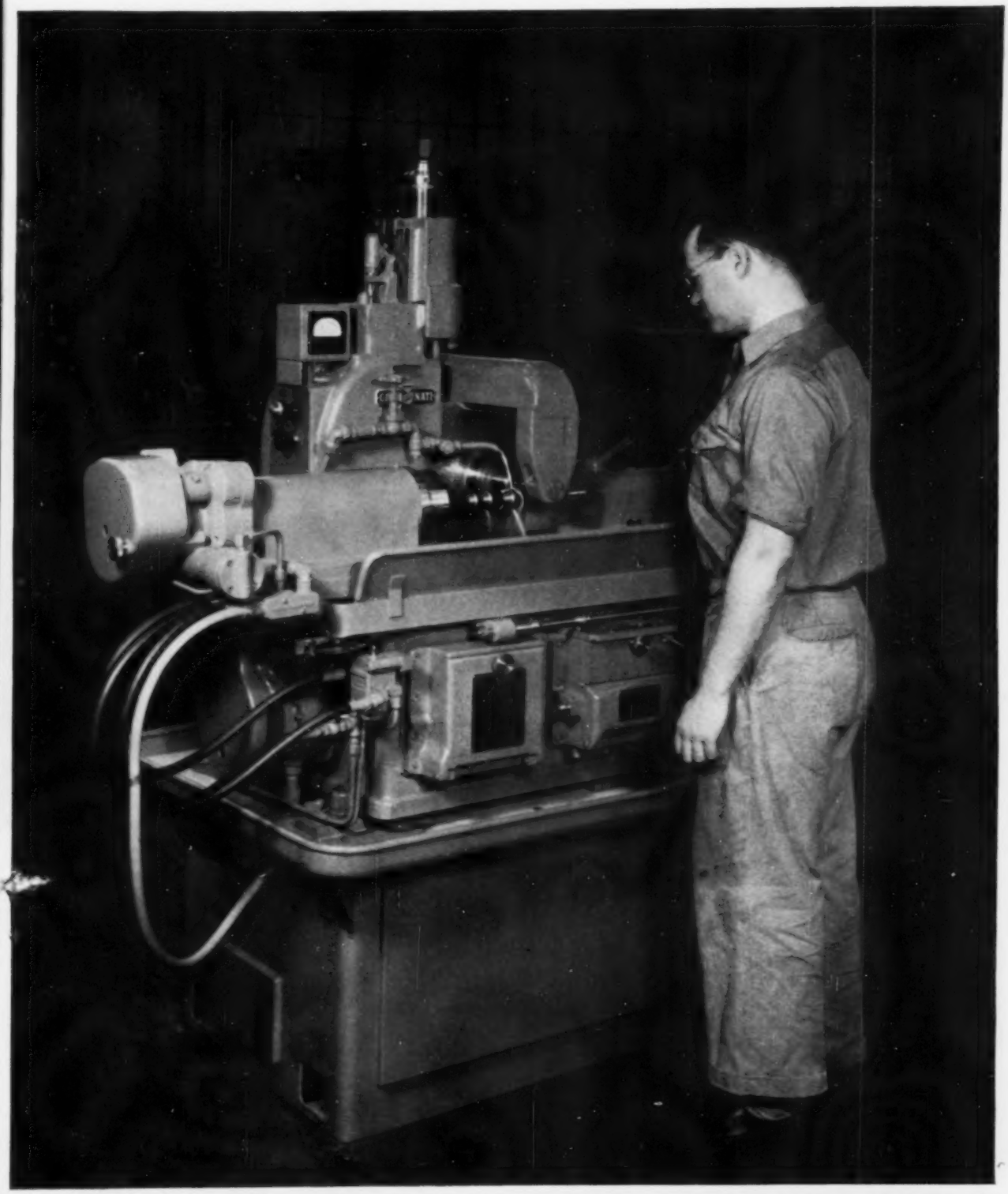
Four to twenty slots are automatically milled in valve stems, on this CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machine tooled up with a cycle controlled automatic index fixture.

Drawing of one of a family of 13 valve stems automatically milled on the CINCINNATI No. 0-8 Automatic illustrated on the opposite page.

Part name . . . . . Valve stem
Material . . . . . Steel
Operation . . . . . Mill slots
Production . . . . . Depends upon part and number of slots. For the part requiring 12 slots, average production is 33 per hour

CINCINNATI®

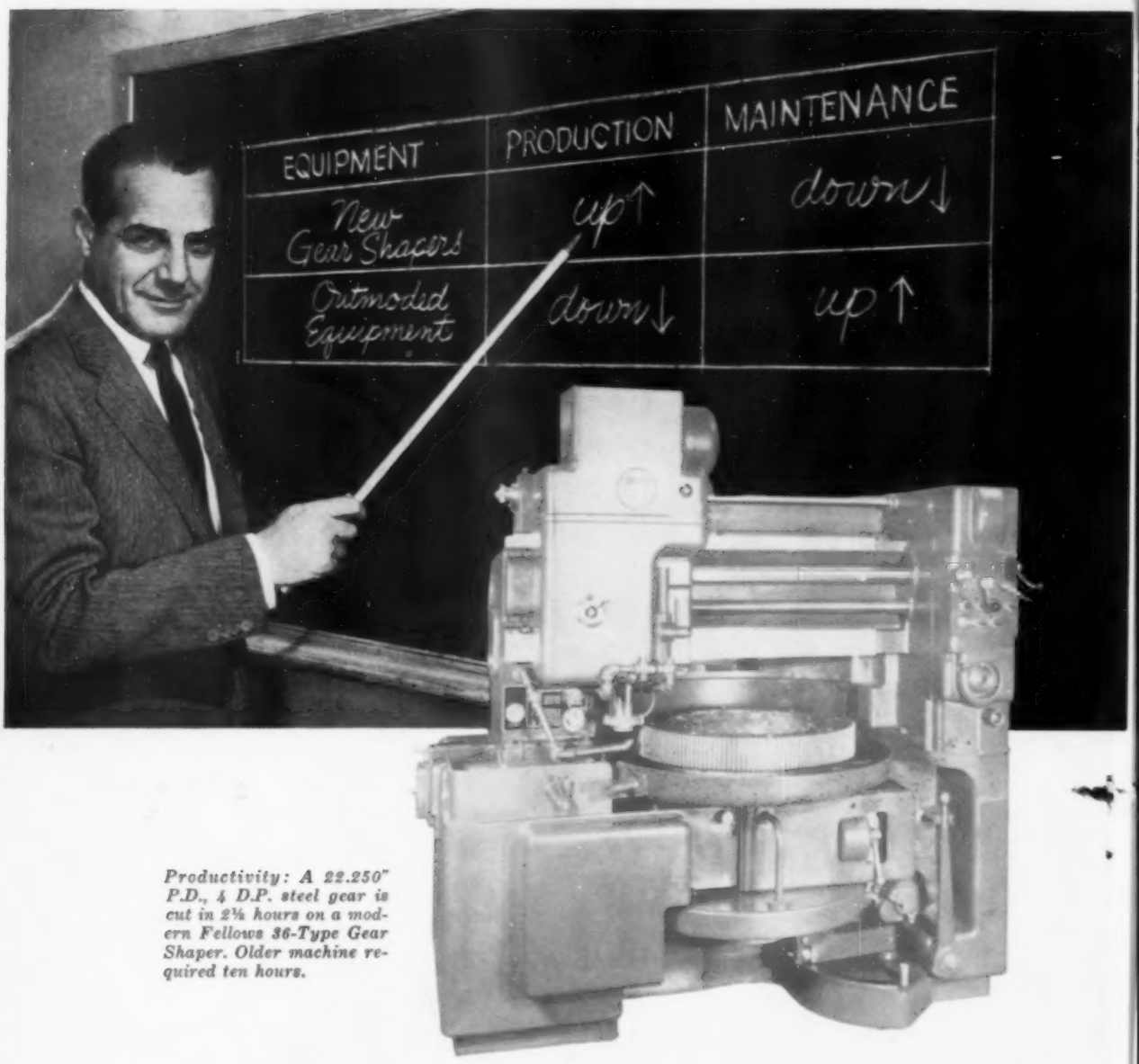
MILLING MACHINES • BROACHING MACHINES • CUTTER METAL FORMING MACHINES • HARDENING MACHINES •



AND TOOL GRINDERS • SPECIAL MACHINE TOOLS
CUTTING FLUIDS • GRINDING WHEELS

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

Modernize FOR



Productivity: A 22.250" P.D., 4 D.P. steel gear is cut in 2¼ hours on a modern Fellows 36-Type Gear Shaper. Older machine required ten hours.

THE PRECISION LINE

LOWER COSTS

with new FELLOWS 36-TYPE Gear Shapers

Two new Fellows 36-Type Gear Shapers can produce more than three or four older machines... and give you extra production versatility, too. In many plants, new Fellows production equipment has lowered unit production costs by more than half, earned back its cost in three years or less.

Fast, accurate, and simple to set up for a wide range of jobs up to 36″ P.D., the Fellows 36-Type is ideal for short runs of varied parts as well as for long runs. Rigid, husky construction permits close tolerances on internal or external spurs, helicals, and herringbones, as well as an almost unlimited variety of cams, splines, and other non-involute shapes. Cutter speeds range from 18 to 300 strokes per minute.

Why not ask a Fellows Representative to *show* you in your plant where you can cut production costs with newer machines? Write, wire, or phone any Fellows office.

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Fellows *Gear Production Equipment*

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Here are the four hardest-hitting "linebackers" in the cutting tool industry . . . good people to have on *your* side.

From them you get *the most* in design, quality, service, and know-how in fitting the product to the job.

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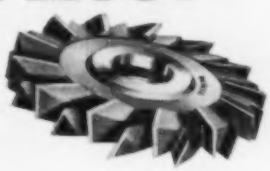
in Cutting Tools



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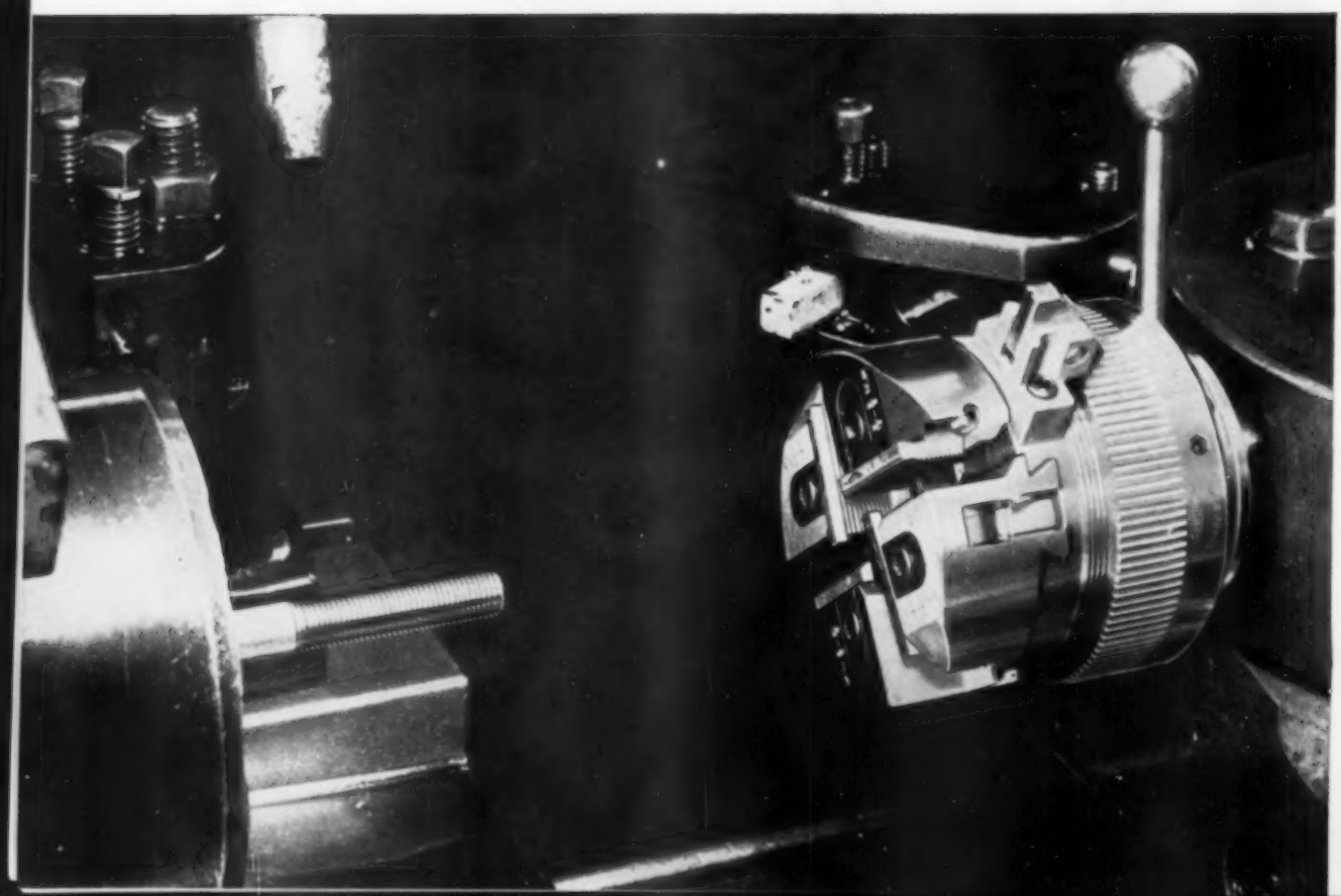


HELD TO .002"

between workpiece O.D. and thread with **LANDIS** *Die Head*

Centering Throat Chasers enabled the LANDMATIC Head to solve a difficult threading problem at the Minneapolis-Honeywell Regulator Co., Valve Division, in Philadelphia, Pa.

Threads on valve stems for diaphram control valves were required to meet a concentricity tolerance of .002" total indicator reading. The 5HH LANDMATIC Hardened and Ground Head using Centering Throat Chasers is the only head tested capable of producing these results.

The Centering Throat Chasers used in this operation are specifically designed for producing threads requiring a high degree of concentricity with the outside diameter of the workpiece. Thus they are particularly adapted for cutting long thread lengths where there is a tendency of the workpiece to run out-of-round.

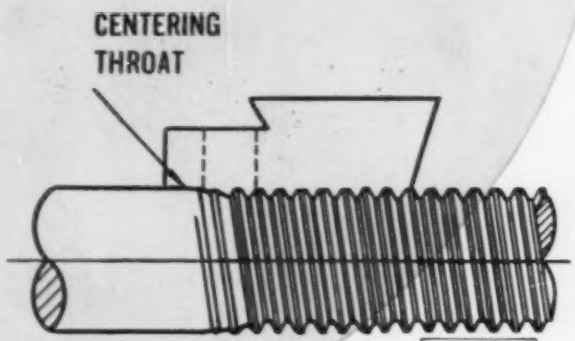
As indicated on the drawing, the centering throat section is allowed to protrude from the chaser cutting edge. This projection varies from $\frac{1}{16}$" for the coarse pitch threads to $\frac{1}{16}$" for the finer pitches. No cutting action takes place on this section of the chaser as it extends over the rotational centerline of the workpiece and only acts as a work aligning and supporting surface.

To produce these stems, $\frac{3}{8}$" 24-pitch UNF threads are cut $1\frac{5}{16}$" long on 316 stainless steel.

Cutting at 30 SFM the 5HH LANDMATIC Head mounted on #2 B & S Hand-Operated Screw Machine, produces these threads to *Class 3 tolerances*. Entire lots of 400 pieces are run without regrinding the chasers.

The LANDMATIC Hardened and Ground Head is a stationary head, designed and built to give the great rigidity required for precision threading. It is available in a variety of sizes for producing threads from $\frac{3}{16}$" to 2" in diameter, and uses the LANDIS Tangential Chaser which may be reground and used for 80% of its original length.

For detailed information, write for Bulletin F-80 — please include specifications.



These THREADING TOOLS displayed at Booth 1538 ASTE Show

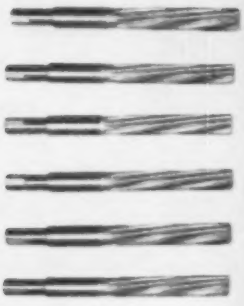
LANDIS *Machine* **COMPANY**

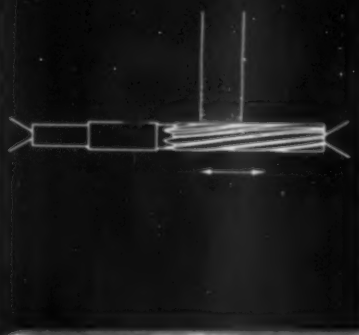
WAYNESBORO
PENNSYLVANIA

473C

Production increased 90%

New Landis 4" x 18" type H Plain Grinder





production data

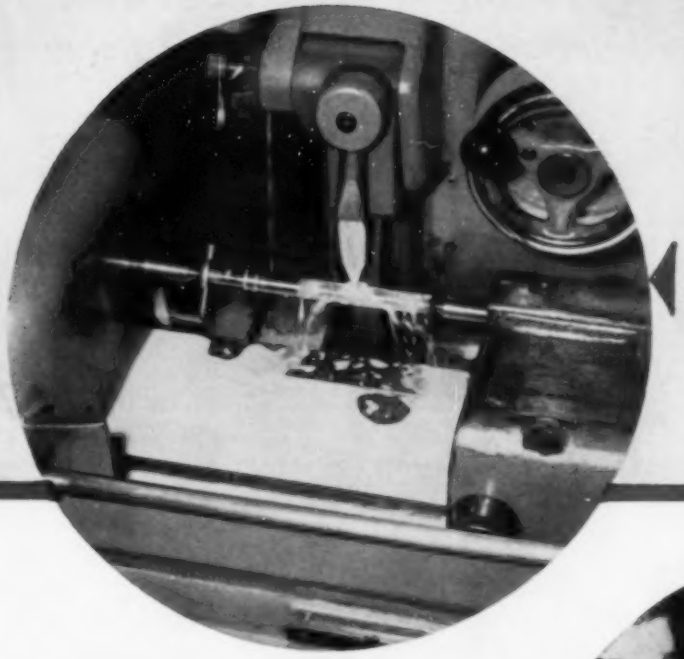
Machine:	New Landis 4" x 18" type H Plain Grinder
Part:	Standard size reamer
Operation:	Grinding standard size reamers to selective sizes
Production:	35 per hour roughing 105 per hour finishing
Material:	High speed steel
Hardness:	61-63 Rockwell C
Stock removal:	Rough—.012"-.014" Finish—.001" with 12 to 18 RMS finish
Tolerance:	.0001"

Landis 4" x 18"
type H Plain Hydraulic Grinder

LANDIS TOOL COMPANY

grinding reamers

replaces old machine, cuts grinding costs



Close tolerances of .0001" are consistently maintained grinding the flutes of these stock reamers to selective sizes.

Stock removal is fast, and sizes accurate with this compact Landis grinder. Convenient Landis eye-level wheel feed makes selective size adjustments fast and accurate.

WAYNESBORO, PENNSYLVANIA

LANDIS
precision grinders

BORING, DRILLING AND MILLING

Greater rigidity is the key! Square lock, full length headstock gibbing on 30 Series table-type Horizontals provides exceptional rigidity for faster, heavier milling cuts, better finishes

Today's demands for "getting out the work at more profit" require full utilization of every machine tool. That means faster, heavier cutting *without* losing finish or accuracy. Such efficiency calls for *extra rigidity!* And G&L 30 Series table-type Horizontal boring, drilling and milling machines *give you more of it!* Because these Horizontals can bore, drill, mill . . . tap, ream, counterbore — do so *many jobs* in fewer setups — they are one of the most profitable machine investments you can make.

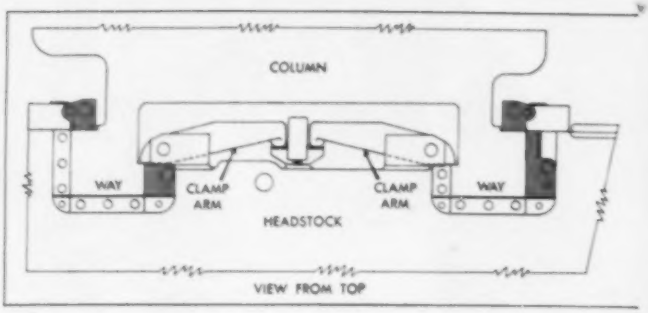
For all these important machining operations, G&L offers you greater headstock rigidity. By locating full-length headstock gibs at the four points shown in drawing at right, maximum rigidity is attained . . . overcoming twists and strains of heavy milling. G&L spindle rigidity is further increased by the sleeve, ram and adjustable take-up collet.

These Horizontals give you positive, hardened and ground, all-geared spindle drive plus high torque and full power you need for efficient milling at low or high speeds. You get 45 separate spindle speeds in fine increments. Trouble-free mechanical G&L directional controls save time, eliminate error. Machine units move in same direction levers are moved. This action is especially valuable in profile milling operations using the 18 independent milling feeds for headstock, table and saddle.

For more 30 Series table-type Horizontal machine details, contact your nearest G&L representative or write direct.

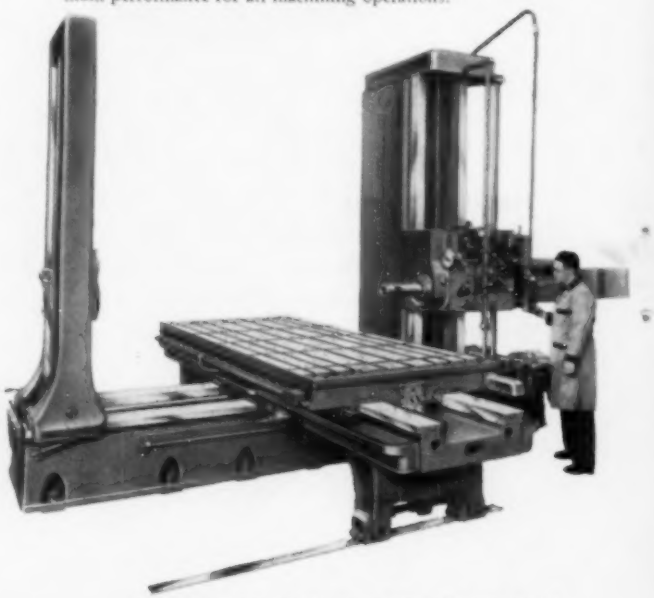
G&L attachments and accessories that extend machining possibilities and profits

The world's broadest range of optional equipment brings maximum return on your machine investment: angular milling attachments, continuous feed facing heads, Dupli-Tracer electronic contour and profiling system, automatic electric positioning and improved measuring devices and a complete line of Davis tooling.



Headstock gibbing guarantees maximum rigidity for travel on heavy, square column ways

Solid, square-lock headstock gib design completely transmits all milling forces to massive, heavily ribbed column. Self-equalizing arms clamp headstock firmly and with equal pressure to wide faces of both column ways. Headstock is guided across both ways with a solid bearing on the front way located close to cutter. This rugged design assures optimum performance for all machining operations.



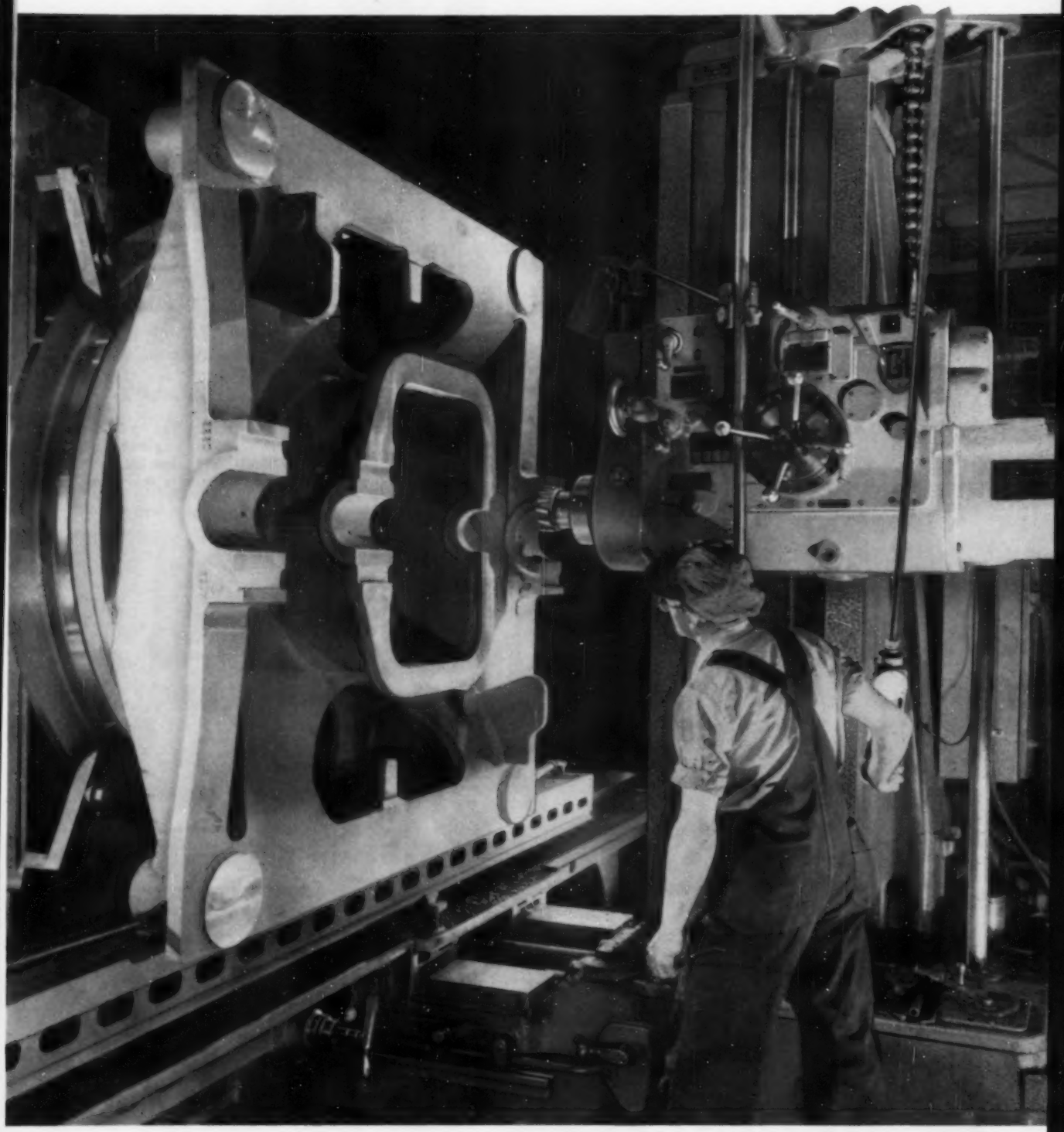
The 30 Series line of Horizontals includes the Model 350-T with 5" dia. spindle (25 hp) and Model 340-T with 4" dia. spindle (20 hp). Both machines offer a broad choice of headstock, table and saddle travel. Other horizontal boring machines are offered in spindle diameters ranging from 3" to 14" . . . main motor drives 10-150 hp.

G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

G-87

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Profile Milling Machines.

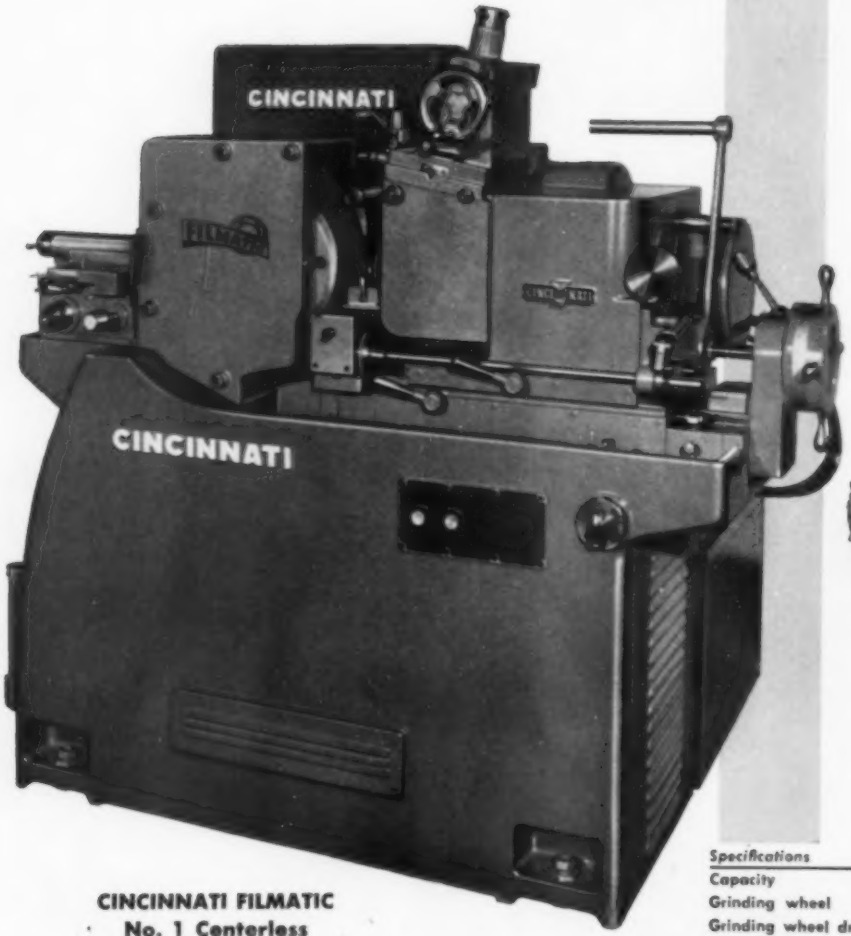
. . . why Giddings & Lewis Horizontals perform milling and other operations faster, at lower cost to you



Three-ton steel carbody (6' x 5½') for excavator is rough and finish milled on this G&L Model 350-T Horizontal. Operations include rough and finish-mill the corner pads, bosses, brackets . . . gear case, hub and bearing faces.

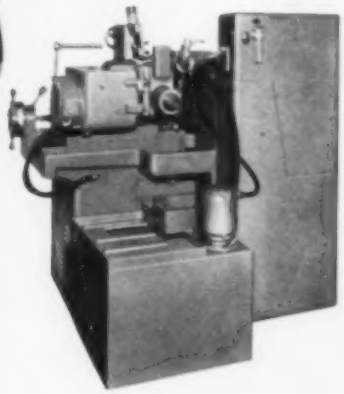
No. 1

. . . a new size in the Cincinnati Filmatic Line



CINCINNATI FILMATIC
No. 1 Centerless
Grinding Machine
Catalog No. G-703

Accessible grinding fluid tank and engineered electrical control cabinet are evident in the rear view.



Specifications

Capacity	0 to 1½" diam.
Grinding wheel	16" diam. x 4" wide
Grinding wheel drive	7½ hp
Regulating wheel speeds	22 to 300 rpm
Floor space (standard)	63" x 61"

CINCINNATI®

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING
ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES •

# of Fine Centerless Grinding Machines

Cincinnati, the world's most experienced builder of centerless grinding machines, presents the new No. 1 size. It has the potential to reduce costs in every shop concerned with precision cylindrical grinding of parts ranging up to 1½" diameter. Many interesting features and construction details give these machines the highest performance rating:

Exclusive FILMATIC grinding wheel spindle bearings . . . over 99% of these bearings on all CINCINNATI Grinding Machines have never required service

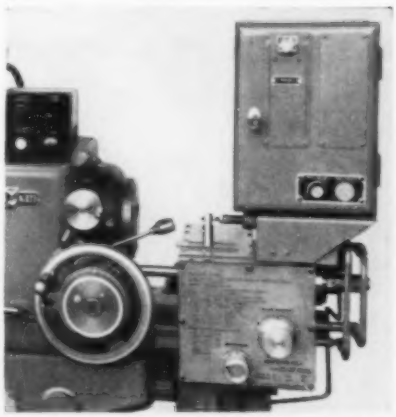
Swivel mounted regulating wheel unit . . . reduces set-up time

Automatic and oil shot lubrication

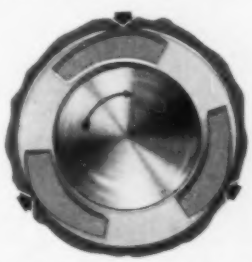
Engineered electrical control cabinet . . . controls are protected from damage and tampering

Selection of nineteen attachments and extra equipment items . . . spindle axial adjustment, crush truing, automatic grinding wheel spindle reciprocation, etc.

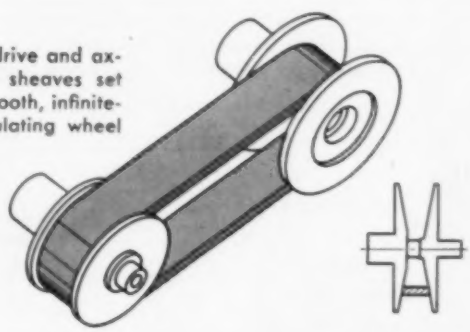
Many additional features, advantages and complete specifications will be found in catalog No. G-703. And Cincinnati gives you an additional advantage not found in catalogs—ENGINEERING SERVICE. ¶ Cincinnati is ready to study your precision grinding methods and recommend improvements wherever possible. May we hear from you?



For high production infeed work, the Electro-Hydraulic Automatic Infeed Attachment is a top-notch performer. Infeed rates and stock removal are dial adjusted.



FILMATIC grinding wheel spindle bearings just never wear out or require adjustment.



V-belt primary drive and axially adjustable sheaves set the stage for smooth, infinitely variable regulating wheel speeds.

CINCINNATI

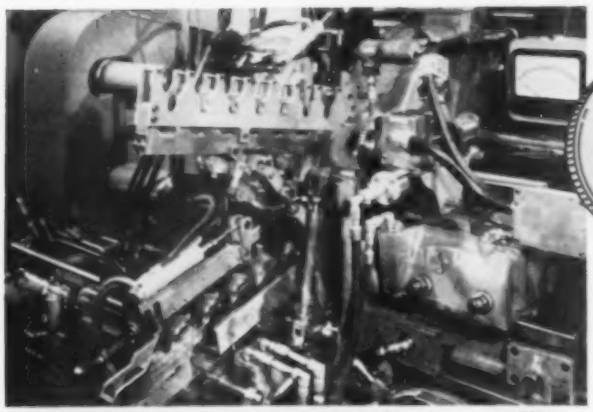
MACHINES • MICRO-CENTRIC GRINDING MACHINES
CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

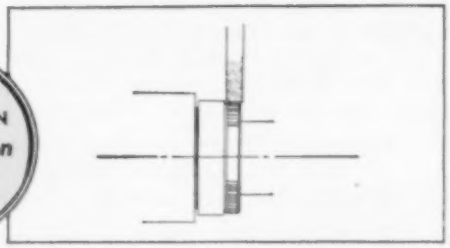
The more you grind the more you save with Norton...

cost-cutting automatic operations

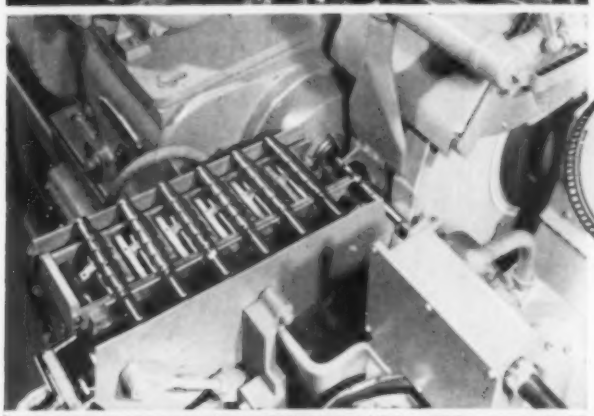
Typical automatic features on Norton grinders



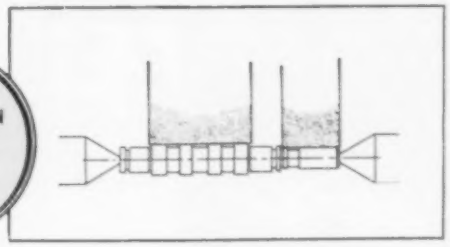
SAVINGS ON *Transmission Gears*



In a Type CTU Cylindrical Grinder arranged for completely automatic loading, grinding, and unloading of transmission gears, the part is held on a chuck and grinding cycle is terminated by an automatic air-electric grinding gage that signals when work is to size.

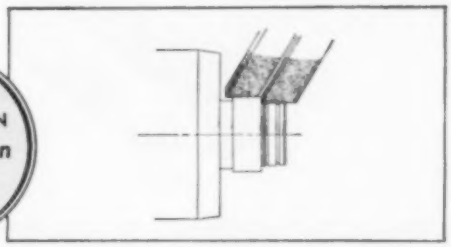


SAVINGS ON *Valve Pistons*

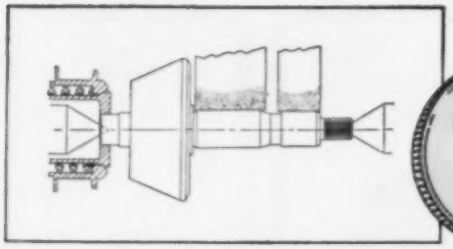


When a Type CTU Grinder is arranged for fully automatic loading and grinding of valve pistons the part is held on centers and driven by a floating type collet. Work is ground by a double-wheel mount.

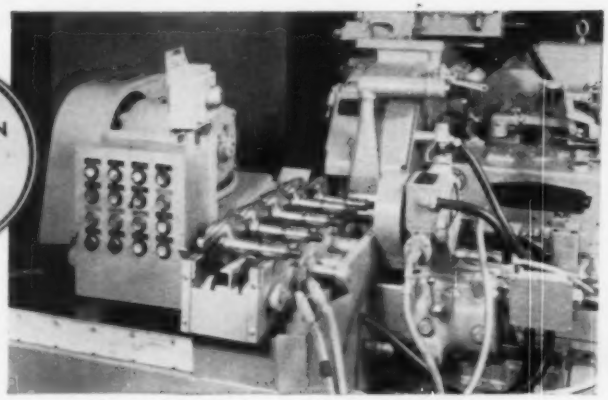
SAVINGS ON *Transmission Sleeves*



On this Type CV-4 Angular Wheelslide Grinder chucked grinding of transmission sleeves is arranged in a completely automatic cycle. Longitudinal movement of a revolving turret loads the machine. A stripper type plate removes the piece when turret retracts as the grind is terminated by electrically timed control.



SAVINGS ON *Stem Pinions*



The Stem Pinion Grinder reduces time and effort with a completely automatic cycle, electrically timed arrangement for grinding these hard-to-handle parts. Progressive escapements in the automatic loading mechanism release the parts in succession, avoiding gear mesh.

NEW ECONOMY!

Norton No. 2 Unitized Transfer Grinder Grinds Crankpins Automatically

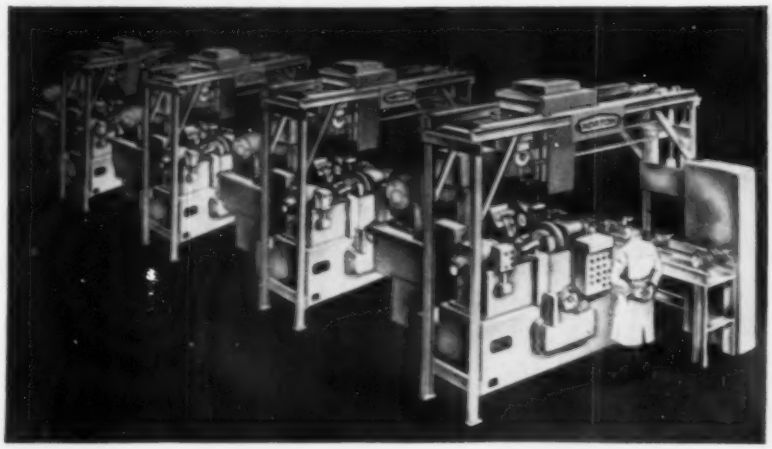
Here's a newly developed machine that automatically grinds crankpins faster and for less money than ever before possible. Advanced features like the following are reasons why:

Unitized Operation. Each grinding station, operating independently, can be automatically by-passed without affecting continuous production.

New Transfer Mechanism. Double set of hooks speeds loading, unloading and transferring of crankshafts from one grinding unit to another.

Fast Production. Cycling grinds 240 crankpins on 60 V-8 crankshafts per hour, due to many automatic operations.

Only One Operator Needed. Others are freed for different jobs. And the machine reduces floor-space requirements.



Norton has developed a wide range of fast, automatic grinders. You can get them in conventional and angular wheelslide types — also in special types for grinding automotive valve faces and crankshaft pins.

Remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost.

For further information about these machines — including how the No. 2 Unitized Transfer Crankpin Grinder can save you many dollars daily — contact your Norton Representative. Or write to NORTON COMPANY, Machine Division, Worcester 6, Mass.

District Offices:
Worcester • Hartford • Cleveland • Chicago • Detroit

To Economize, Modernize with NEW

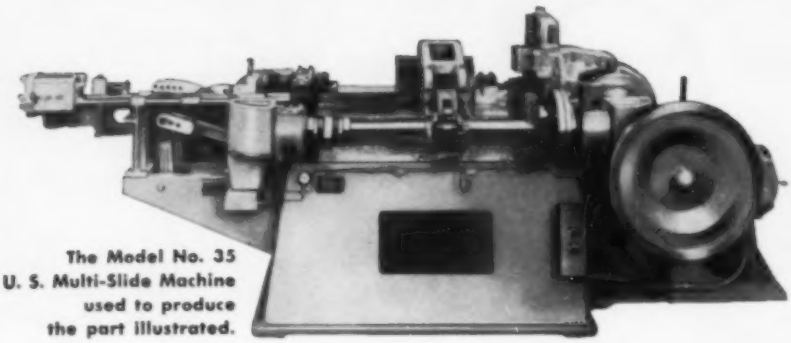
NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

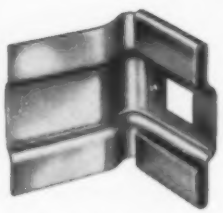
NORTON PRODUCTS:
Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING DIVISION:
Coated Abrasives • Sharpening Stones • Behr-cat Tapes



The Model No. 35 U. S. Multi-Slide Machine used to produce the part illustrated.

U.S. MULTI-SLIDE® MACHINES ELIMINATE SECONDARY OPERATIONS



The cost saving potential of U. S. Multi-Slide Machines is, once more, demonstrated here in the economical production of a stamped automotive part.

By using the No. 35 U. S. Multi-Slide, the Production Metal Stamping Company of Toledo, Ohio is able to completely eliminate all secondary operations and handlings in the production of the formed stamping illustrated.

The No. 35 U. S. Multi-Slide produces this part in one operation. Cold rolled steel .059" thick by 3.210" wide is fed into the machine from coils and finished parts are produced at the rate of 85 per minute.

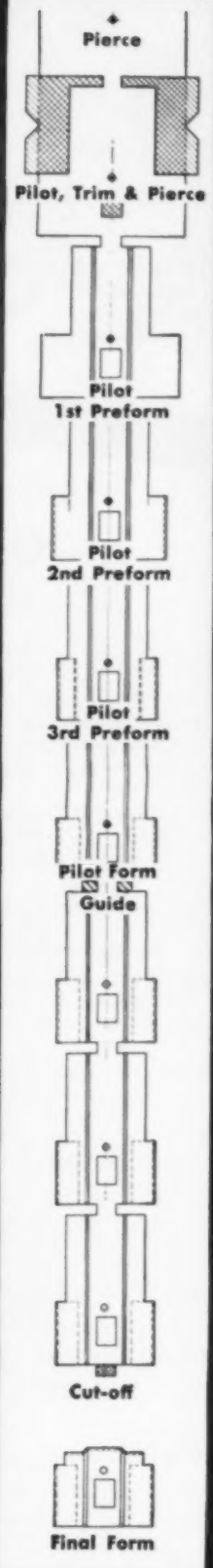
Each of the four models of U. S. Multi-Slide Machines is designed for the economical production of stampings. They are adaptable to the manufacture of wire parts as well as stampings from flat coil stock. In some instances more than one strip can be fed into a U. S. Multi-Slide for processing and completing an assembly. Prefabricated parts can be hoppered, positioned and assembled to the stampings being made while still in the machine. It is because of this versatility that the use of U. S. Multi-Slide Machines can considerably lower your component costs.

For the uniform, economical production of stampings — write for your copy of the U. S. Multi-Slide Bulletin No. 15-A — or send us your part drawings or samples for our recommendation.

MULTI-SLIDE

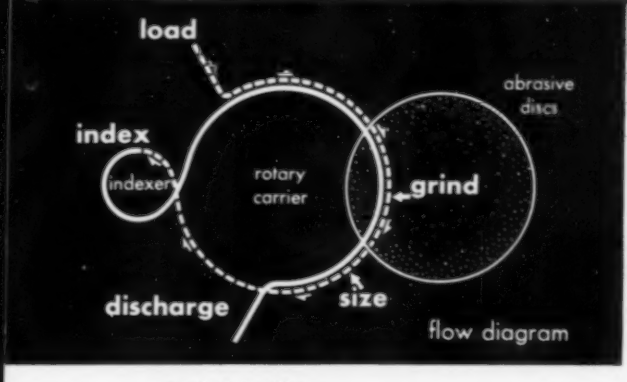
U. S. TOOL COMPANY, INC. AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories



Disc grinds 2400 universal joint spiders complete per hour . . . automatically

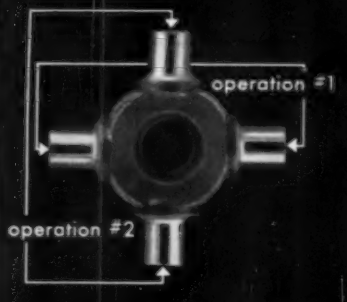
. . . automatic indexing grinds 4 trunnion ends in one loading



Production:
2400 parts per hr.

Stock Removal:
.015" max. overall

Tolerances:
.001" overall uniformity (end-to-end grind)
.001" center dimension (from axis of either pair of trunnions to either end of the complementing pair)



special tooling

Automatic indexing: turns spiders 90°; reloads parts into carrier

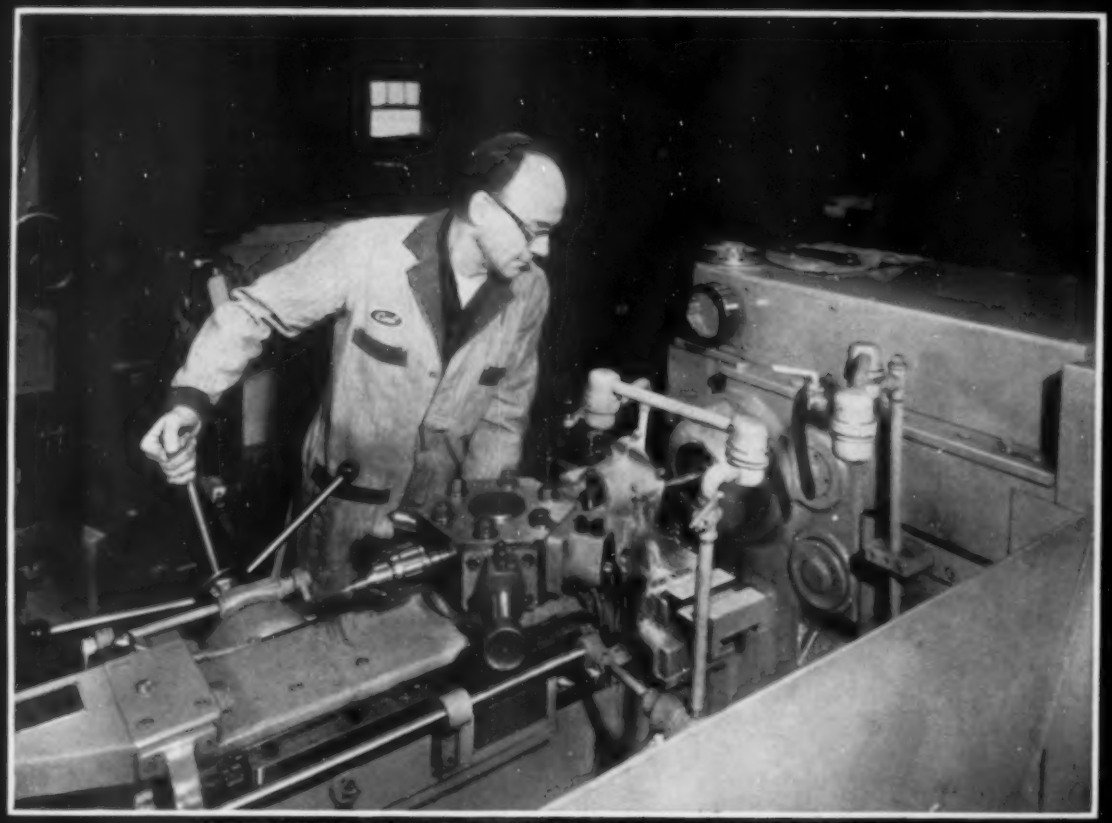
Post process gauging: controls each grinding head independently; maintains equal trunnion lengths; compensates for abrasive wear

GARDNER

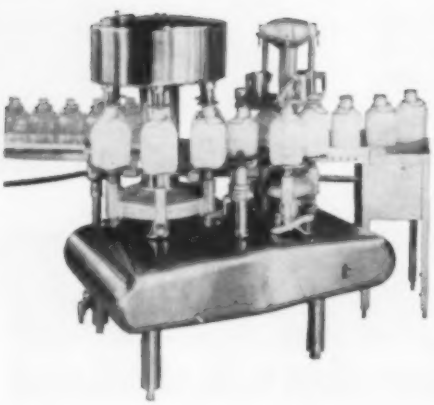
precision disc grinders

BELOIT, WISCONSIN

WARNER & SWASEY NO. 4



Warner & Swasey No. 4 Turret Lathe for machining stainless steel dairy equipment components (shown at right) at Federal Mfg. Co., Milwaukee, Wisc.



SPECIALIST PRODUCER of milk bottle filling and capping machines, Milwaukee's Federal Mfg. Co.—a small, but most progressive organization—is today enjoying a phenomenal growth. This is due to the dairy industry's enthusiastic acceptance of their new and unique 'Vacu-Matic' filling machines.

PROBLEM—Precision components of these machines—produced in average lots, ranging from 100 to 300 pieces—are of 303 stainless steel. Required machining tolerances were .0005", and surface finishes of 40 micro-inches had to be held in order to keep subsequent polishing costs to a minimum.

SOLUTION—Federal's Warner & Swasey No. 4 Ram Type Turret Lathe, combined with operator skill and a sound preventive maintenance program, adequately met the desired accuracy and surface finish specifications—and, in addition, increased production three times above rates obtainable on their older turret lathes.

YOU CAN PRODUCE IT BETTER,

HOLDS .0005" ACCURACY...

triples production rate for Federal Mfg. Co.

OPERATOR REPORTS—"Ease of machine handling made possible our sizable production increase. We make full use of the lathe's 6 to 1 high-low shift and two-speed motor which instantly and effortlessly provide a choice of four speeds without preselection—a time-saver for changing speeds from turn, to ream, to cut off, etc. In all, our new No. 4 all-clutch hydraulic headstock, with its two-speed motor, provides a total of 24 *unduplicated* speeds—any of which can be preselected while under cut, and instantaneously thrown into action by the flip of a lever. We also like the higher speeds and the easier, faster handling of the apron controls."

This is the kind of production you can expect in your own shop when you replace older turret lathes with modern Warner & Swaseys. Call in our Field Representative to talk about specific applications in your shop.

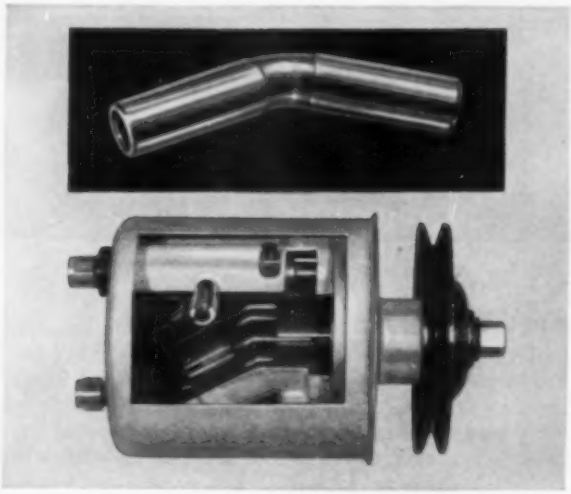
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

FASTER, FOR LESS... WITH A WARNER & SWASEY

...Flange it!
Flare it!
Bend it!
Expand it!

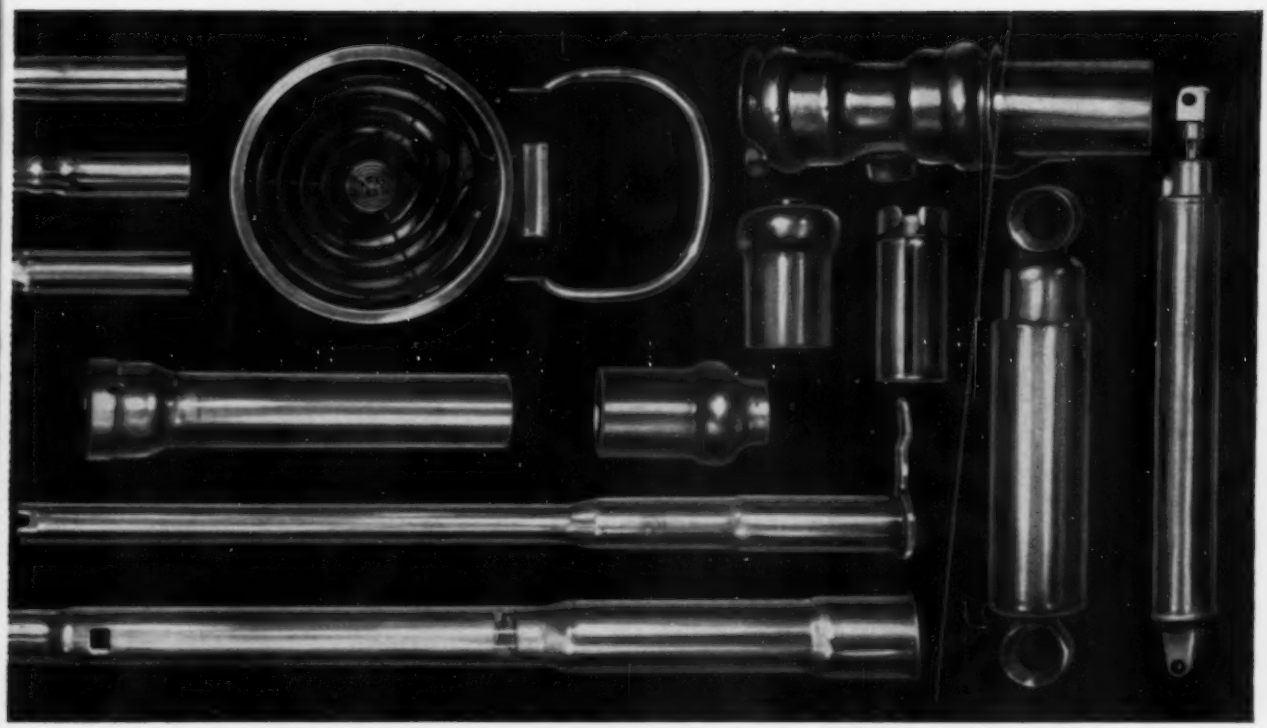
Republic ELECTRUNITE

RANGE BURNER MANUFACTURER STEPS OUT with Republic ELECTRUNITE Mechanical Tubing. Harper-Wyman Company uses it in forming lightweight, easy-to-clean venturi burner tubes. The company subjects ELECTRUNITE to a hairpin bend of 1¼ diameter radius, then a four-way crimp, followed by punching, notching, and welding. Uniform, predictable ductility avoids stretch and collapse as tubing is severely bent and formed. Republic engineers will help you design ELECTRUNITE into your product to speed production, cut costs, and improve performance. Mail the coupon for facts. Or call your Republic representative.



WHEN IT'S MOVING . . . MAKE IT TUBING

Republic ELECTRUNITE meets all close tolerance requirements for new Thompson Products automotive pump. Close tolerance, uniformity, ductility, workability — four important performance requirements, all reasons why Republic ELECTRUNITE Mechanical Tubing is used in a new automotive hydraulic power pump assembly. This pump furnishes power for power steering featured by a nationally famous automobile manufacturer. Will-O-Hill Industries, Inc., Willoughby, Ohio, sub-contractor, manufacturers and specialists in close tolerance tubular stampings, cut ⅞-inch diameter ELECTRUNITE into units 2⅜ inches long. Each unit is rolled to form a slight groove in the center and bent to an angle of exactly 150°. Nine such pieces are used in each pump assembly. For additional information, send coupon or write today.



Mechanical Tubing

fabricates easily . . . economically . . . with uniformity

Quality makes the big difference!

Republic ELECTRUNITE® Mechanical Tubing is quality-controlled from ore to finished product; produced from highest quality flat-rolled open-hearth steel made in Republic's own mills; carefully inspected to Republic's rigid requirements. Republic Tubing is welded by the exclusive ELECTRUNITE process—a continuous electric weld method that unites the wall under pressure without the addition of foreign or extra metal. Tests prove the ELECTRUNITE weld is as strong or stronger than the original base metal.

Among other advantages, this process assures uniformity of wall thickness, strength, ductility, concentricity, diameter, and physical and mechanical properties. And as the world's largest producer of specialty welded tubing, Republic has the facilities, abilities, and equipment to tailor the tube to your end use. Republic also offers complete tube fabricating facilities.

Let Republic engineers help you select the most economical ELECTRUNITE Tubing to meet your severe processing needs. Call your Republic representative or write today.

REPUBLIC STEEL

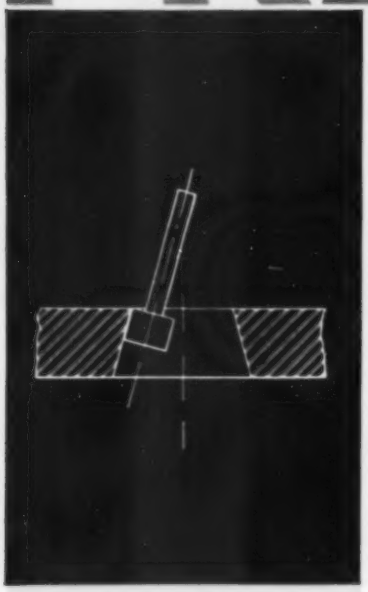
World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-5160
292 EAST 131ST STREET • CLEVELAND 8, OHIO

Please send the following information:
☐ Republic ELECTRUNITE Mechanical Tubing
☐ Fabricating Facilities
☐ Please have a Republic Engineer call

Name_____ Title_____
Firm_____
Address_____
City_____ Zone____ State_____

PRECISION



TAPER
(and straight)

PLANETARY

OUTFEED wheel to grind hole, INFEED to grind O. D. of part
Axis of wheel spindle—high speed rotation
Planetary path of wheel spindle around main spindle axis—slow hand rotation

CONTOUR
(with head)

MOORE-FOSDICK JIG GRINDER

A new degree of speed, convenience and capacity is brought to precision grinding in the Moore-Fosdick Jig Grinders. This combination of the unique Moore Grinding Head with Fosdick Jig Borer Tables makes possible advantages never before available.

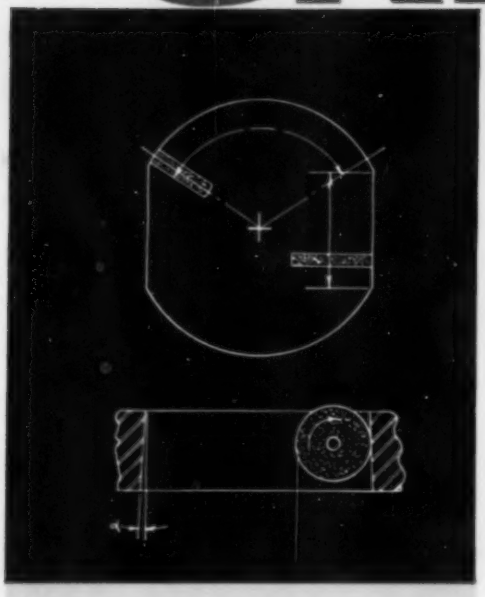
All standard jig grinding operations can speedily and conveniently be accomplished on the Moore-Fosdick, in addition to many which were formerly known as "trick" operations. Both straight and tapered holes can be located and ground, as well as contours consisting of radii and tangents or chordal surfaces.

The angular and indexing device built into the main spindle and the slot grinding attachment permit quick, accurate grinding of any contour, regular or irregular. Setting work on a rotary table is unnecessary except for angular surfaces. Chop grinding removes stock rapidly and makes contour grinding even faster.

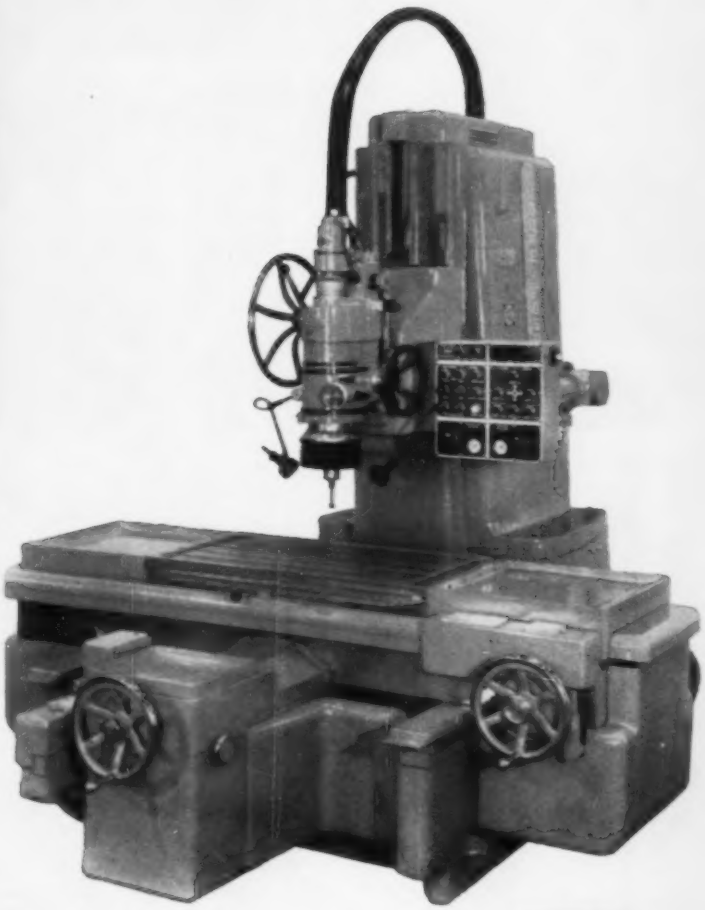
An infinite range of grinding speeds—from 12,000 to 60,000 rpm—allows accurate control

GRINDING

OF LARGE WORK



CONTOUR
(with slot grinder)



of grinding and stock removal. Long-lasting precision is assured by quality construction and by many features that provide dimensional stability, including spindle-housing heat control.

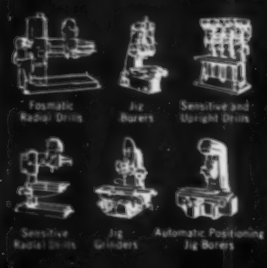
The machine may be ordered in any one of three models, one of which comes in two sizes. *All will give accuracy of ± .0001".*

Measuring is accomplished with measuring rods and inside micrometers or with Direct Dimension Measuring, where dimensions are simply set from blueprint to direct reading drum dials. Automatic positioning is also available.

Numerical control by punched tape or cards is available.

For a complete description of the various grinding operations, measuring systems and other machine features—many exclusive with Moore-Fosdick, write today for your jig grinder catalog.

Ask for Bulletin JG-A.

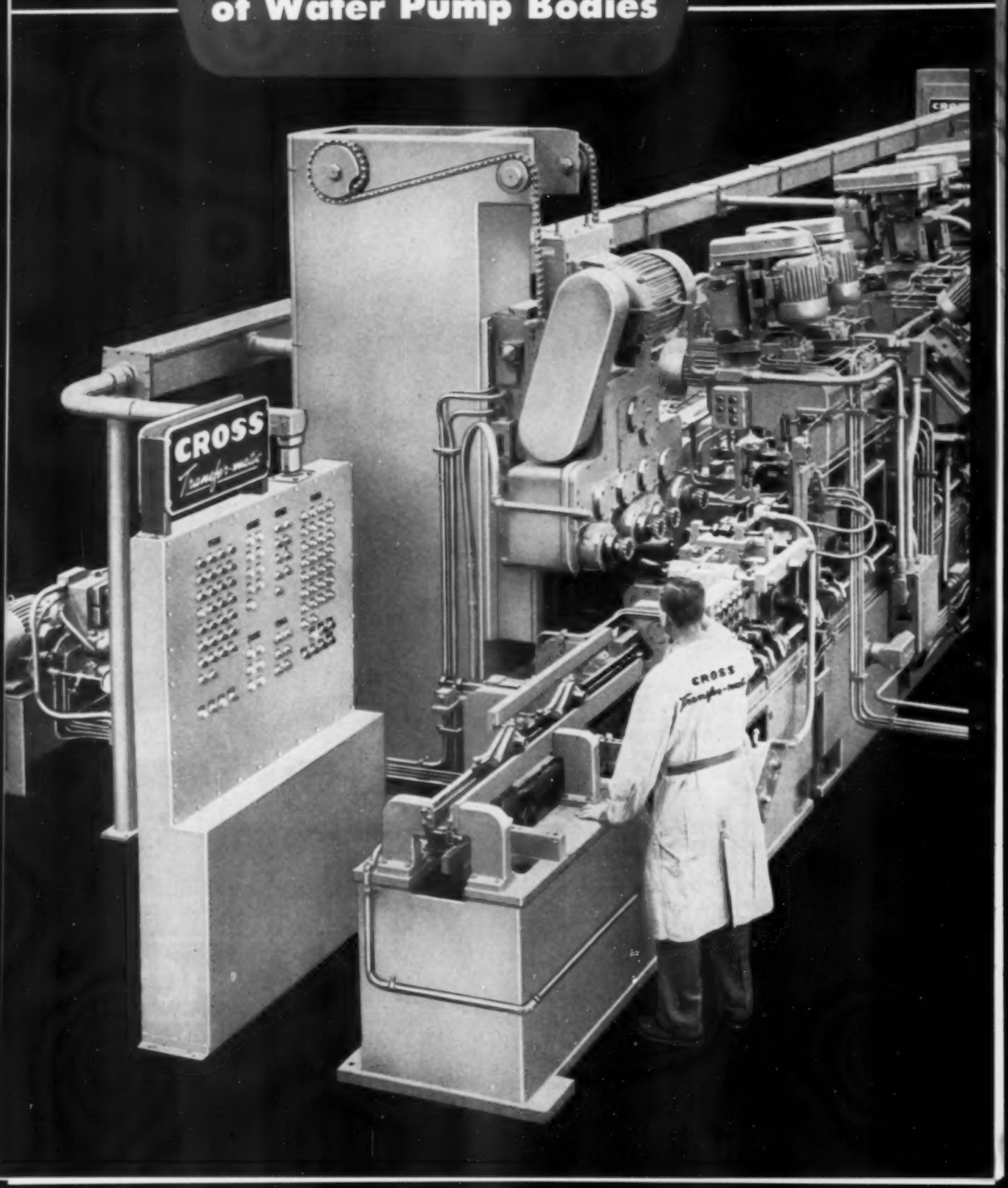


NEED DRILLING EQUIPMENT?
GET A PROPOSAL FROM FOSDICK!

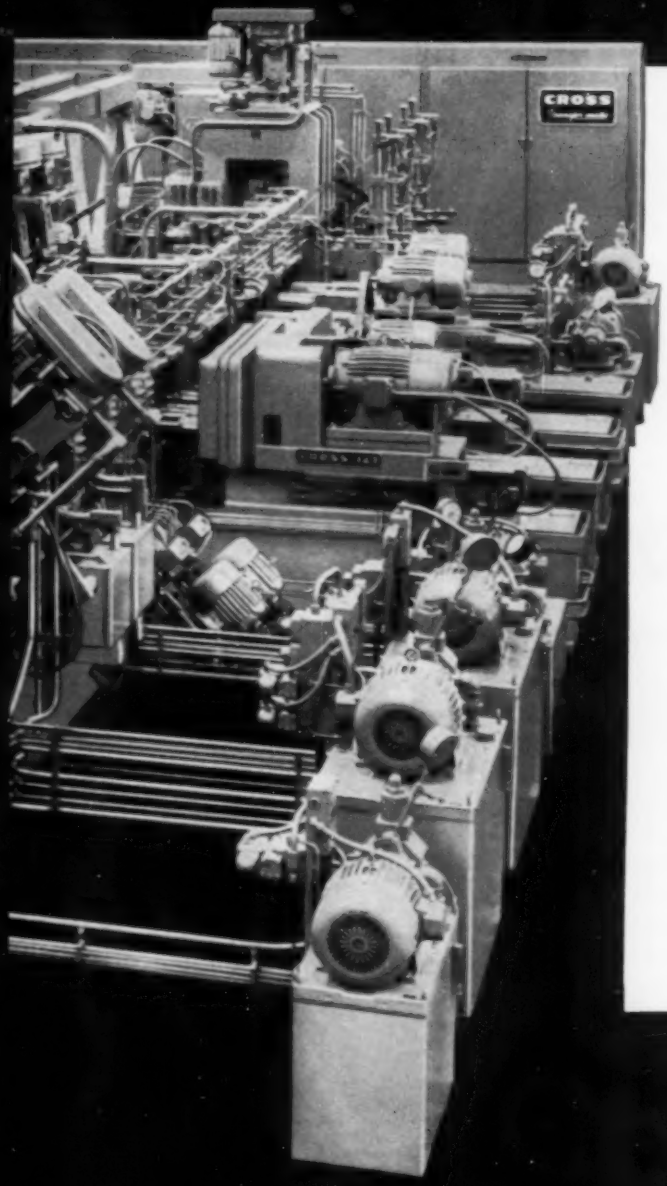
FOSDICK

THE FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

Complete Machining of Water Pump Bodies



Another Transfer-matic by Cross



★ Machines two castings simultaneously at rated capacity of 200 pieces per hour.

★ Station 1 load; Station 2 mills mounting faces; Station 3 drills thermostat by-pass hole, mainshaft hole and four mounting holes; Station 4 cross-faces cover face and drills one angular vent hole; Station 5 chamfers thermostat by-pass hole, drills six cover holes, spot-faces mainshaft hole on inside; Station 6 cross-faces impeller face, reams thermostat by-pass hole and drills second angular vent hole; Station 7 spotfaces and chamfers mainshaft hole, spotfaces four mounting holes and drills by-pass hole on inside; Station 8 finish cross-faces impeller face and recesses center of mainshaft hole; Station 9 semi-finish bores mainshaft hole; Station 10 finish precision bores mainshaft hole; Station 11 tap drills heater connection hole and probes cover holes; Station 12 taps heater connection hole and six cover holes; Station 13 automatically unloads two pump bodies.

★ Locating: in Station 2, parts are located from foundry pads; in Station 3, from milled faces and cored water passages; and, from Station 4 on, from milled faces and two mounting holes.

★ Cross' "building block" principle provides flexibility for future part design changes.

★ Other features include: complete interchangeability of all standard and special parts for easy maintenance, construction to JIC Standards, hardened and ground ways and automatic lubrication.

Established 1898

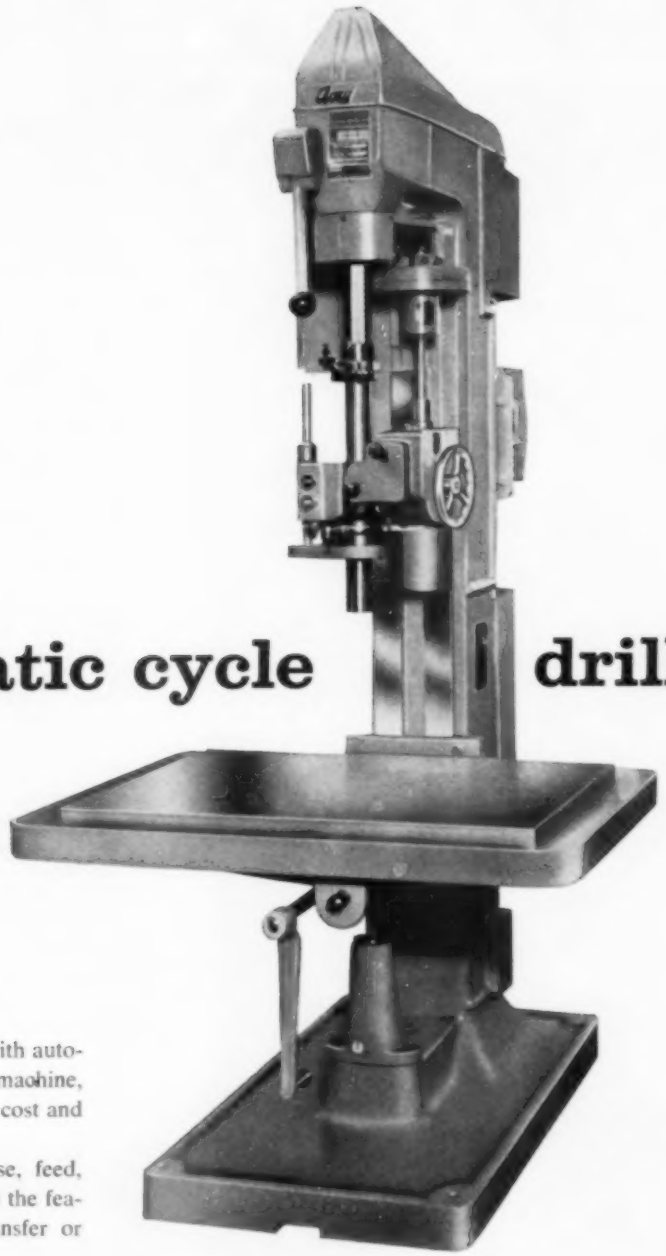
THE **CROSS** CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

■ For help in cutting the cost of your drilling operations, call one of these competent distributors near you:
Asheville: Tidewater Supply Co.

automatic cycle drilling



■ You can chop your time costs with automatic set-ups on this new Avey machine, and still take advantage of the low cost and flexibility of a standard unit.

Adjustable rapid power traverse, feed, and rapid return of the spindle are the features which permit automatic transfer or rotary index fixturing.

At the same time, you get adjustable feeds, speeds, table travel, head travel, and Avey's advanced spindle construction.

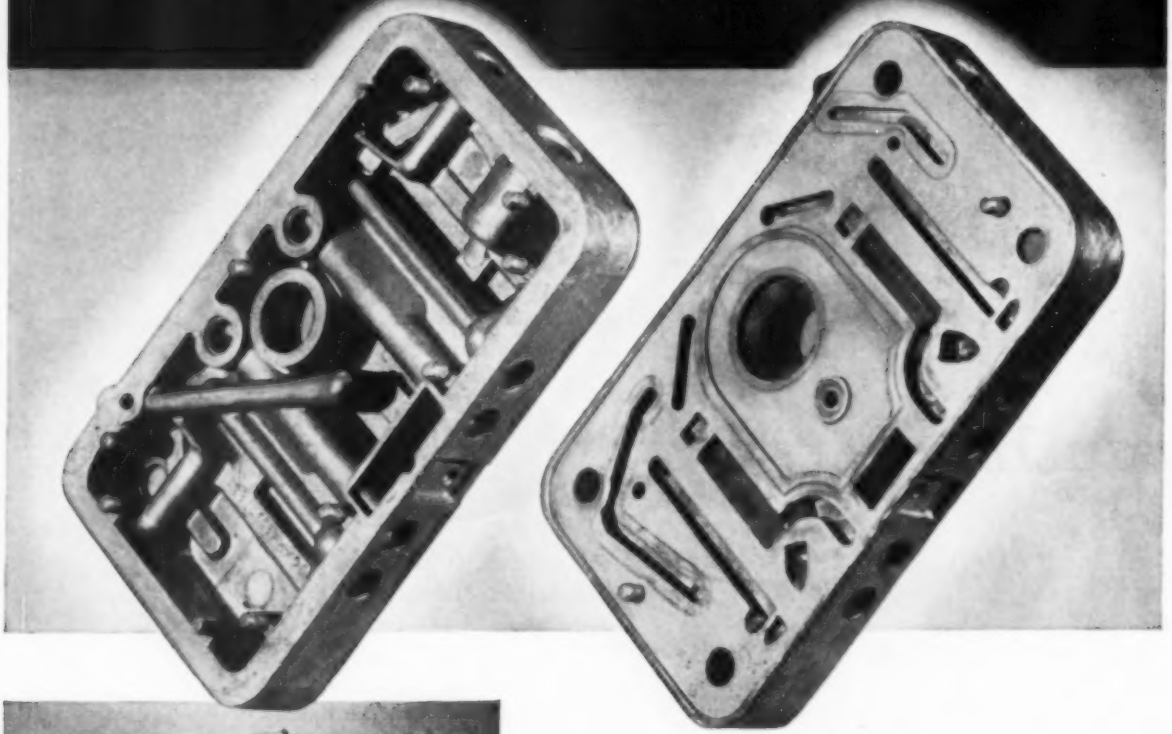
The machine is available with No. 2, 3, and 4 Morse Taper; 1 to 3 HP motors; single or multiple spindles. Your request for additional information will be promptly answered. Avey Division, The Motch & Merryweather Machinery Co., Box 625, Cincinnati 1, Ohio.

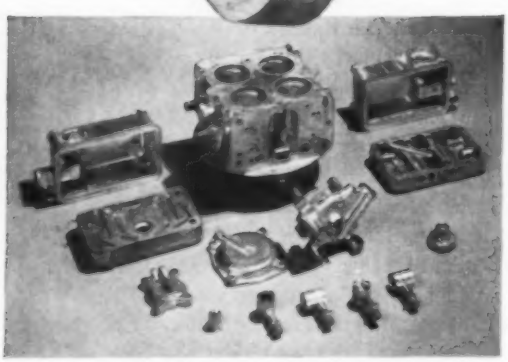
■ For help in cutting the cost of your drilling operations, call one of these competent distributors near you:
Asheville: Tidewater Supply Co.
Atlanta: R. O. Deaderick Co.
Birmingham: McVoy-Hausman Co.
Boston: Rudel Machinery Co., Inc.
Buffalo: Rudel Machinery Co., C. H. Briggs Division
Charlotte: Tidewater Supply Co.
Chattanooga: R. O. Deaderick Co.
Chicago: Marshall & Huschart Machinery Co.
Cincinnati: Motch & Merryweather Machinery Co.
Cleveland: Motch & Merryweather Machinery Co.
Columbia: Tidewater Supply Co.
Dallas: Briggs-Weaver Machinery Co.
Dayton: Motch & Merryweather Machinery Co.
Denver: Overgard Machine Tool Co.
Detroit: Motch & Merryweather Machinery Co.
Ft. Lauderdale: Southeast Machinery Co.
Houston: Oliver H. Van Horn Co., Inc.
Indianapolis: State Machinery Co.
Kansas City: Blackman & Nuetzel Machinery Co.

another first by Avey

Knoxville: R. O. Deaderick Co.
Los Angeles: Tornquist Machinery Co.
Milwaukee: Marshall & Huschart Machinery Co.
Minneapolis: The Satterlee Co.
Montreal: Rudel Machinery Co., Ltd.
New Orleans: Frederick & Baker Co.
New York: Rudel Machinery Co., Inc.
Norfolk: Tidewater Supply Co.
Philadelphia: Machinery Associates, Inc.
Phoenix: Southwest Machine Tool Co.
Pittsburgh: Motch & Merryweather Machinery Co.
Portland: Halladie Machinery Co.
Roanoke: Tidewater Supply Co.
Rochester: Rudel Machinery Co., C. H. Briggs Division
Rockford: Marshall & Huschart Machinery Co.
Rock Island: Marshall & Huschart Machinery Co.
San Francisco: Harron, Rickard & McCone Co.
Seattle: Halladie Machinery Co.
Shreveport: Frederick & Baker Co.
South Bend: Marshall & Huschart Machinery Co.
St. Louis: Blackman & Nuetzel Machinery Co.
Syracuse: Rudel Machinery Co., C. H. Briggs Division
Toronto: Rudel Machinery Co., Ltd.
Vancouver: Rudel Machinery Co., Ltd.
Washington: Machinery Associates, Inc.
West Hartford: Rudel Machinery Co., Inc.
Windsor: Rudel Machinery Co., Ltd.

FOR *Extremely Complex Shapes* AND *Close Tolerances* **ZINC** *DIE CASTINGS ARE BEST*





14 ZINC Die Castings make up principal components of the Holley four-barrel downdraft carburetor.

HOLLEY Carburetor Co. has these exacting metering bodies as well as 12 other principal parts of the Model 4150 carburetor made of ZINC because ZINC Die Castings are best suited for the job. Extreme complexity of shape of all these components, close tolerances of the air and fuel passages in the metering bodies and rigid efficiency requirements of the product demand the accuracy, strength, reliability and economy of ZINC Die Castings.

HORSE HEAD SPECIAL ZINC AND ZAMAK ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

DEVELOPERS OF THE MODERN ZINC DIE CASTING ALLOYS IN USE TODAY

160 Front Street • New York 38, N. Y.

HORSE HEAD PRODUCTS

EVERY FEATURE OF THIS VARIABLE SPEED DRILL IS DESIGNED FOR OPERATOR EFFICIENCY!

Painstakingly engineered and handcrafted by "Buffalo" to create the finest variable speed drilling machine that money can buy, the "RPMster" sets a new standard of drilling ease and smoothness that's certain to increase the efficiency and output of your operators. A touch of the easily-reached controls on the head gives the operator instant and infinite speed changes ranging from 100 to 3000 RPM. Contributing to the accuracy, dependability and trouble-free long life of the "Buffalo" "RPMster" are the gearless variable speed drive — precision spindle — reliable, all-geared power feed — hand-scraped ways on both head and table — finest alloy steel components, heat treated prior to machining. Available in one to six spindle models, with tapping attachments.

For a totally new experience in drilling accuracy and operational ease, with vibration reduced to an absolute minimum, arrange for a demonstration of the "RPMster" with your nearby "Buffalo" machine tool dealer. Or write direct for Bulletin 3967-A.

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

BUFFALO FORGE COMPANY

509 BROADWAY • BUFFALO, N. Y.

Canadian Blower & Forge Co. Ltd., Kitchener, Ont.

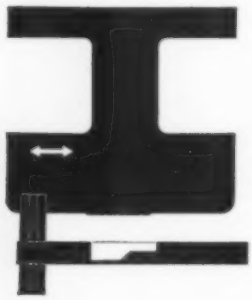
DRILLING PUNCHING SHEARING BENDING

New turning idea is born...

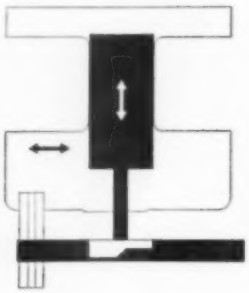
1. Problem workpiece—spiral rotor for pumps. Roots-Connersville Blower Co., Connersville, Indiana, had been machining these rotors on a shaper. The trouble was . . .

2. Shaping just couldn't produce the wide variety of exact contours their engineers wanted. Could rotors be *turned*—automatically?

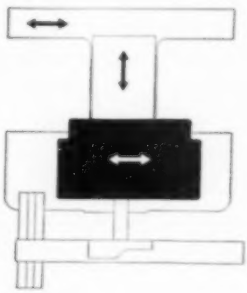
3. Why not? With special end gearing and full nut, we can "chase" the spiral shape like a coarse thread. That's easy . . . the problem is the contour.



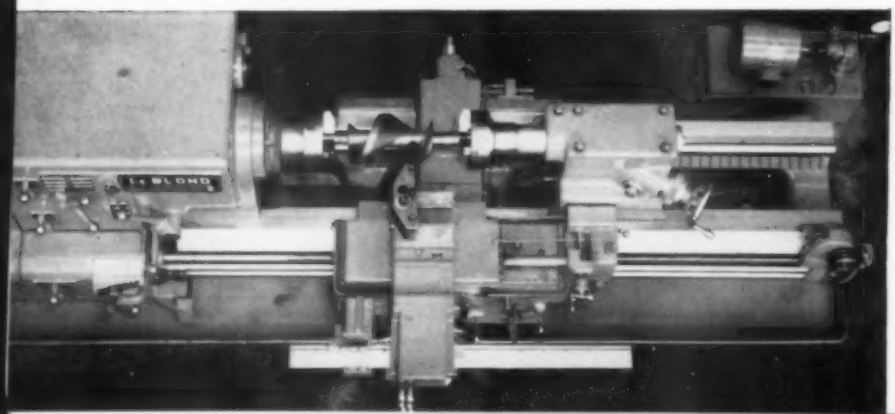
6. Let's see how this looks in plan. The carriage provides length motion for the tool. The template carrier moves lengthwise with the carriage.



7. The cross slide gives cross travel plus automatic tool relief. The template carrier also moves "in and out" with the cross slide.

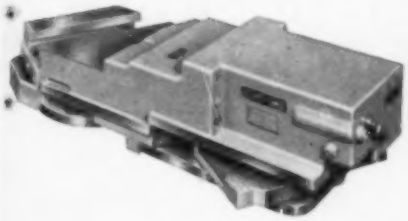


8. The special length slide gives us feed. Not continuous feed. Just tool-positioning feed that moves the stylus slightly along the template for each successive cut.



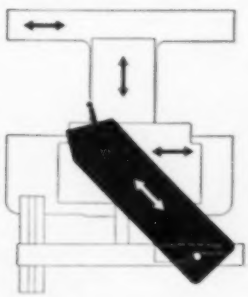
11. Here's the finished machine—the LeBlond Contour Chasing Lathe, basically a 32" Standard Duty. Modifications include: special end-gearing, full nut, special length slide, automatic cycling and special heavy duty reversing electrics.

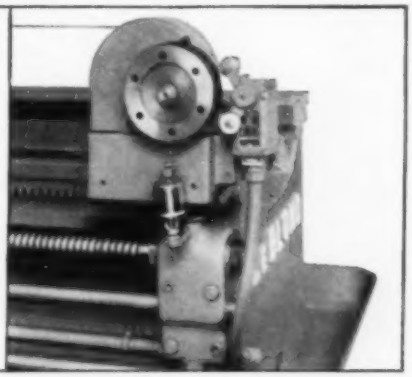
LeBlond Engineers turn trick with tracer



4. How about using Hydra-Trace? We've produced plenty of close tolerance contours with Hydra-Trace.

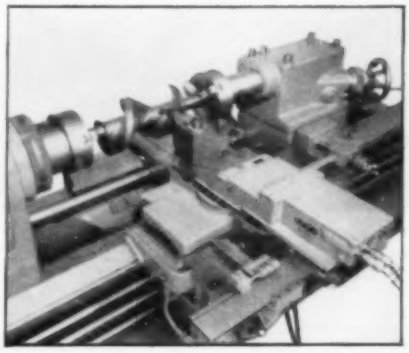
5. We'll use Hydra-Trace to *position* the tool (not to trace). We can mount a special length slide on the cross slide to give us feed *between* cuts.





9. The template controlled Hydra-Trace positions the tool for each successive cut to produce the contour. During the cut, no feed takes place. Only the chasing action.

10. One more detail. Remember, the whole action must be automatic. We'll need automatic cycling and a tool release mechanism. That does it.



12. Rotor workpiece shown has 10″ lead— concave on one side, convex on the other. (Lathe chases leads from 4½″ to 16″.) On the left hand rotor, cutting is from headstock to tailstock. On mating right hand rotor, from tailstock to headstock.

We welcome the opportunity to solve your special turning problems. Tell us about them. Call or write for an engineering appointment.

. . . cut with confidence

LeBLOND of Cincinnati

The R. K. Leblond Machine Tool Company
Cincinnati 8, Ohio

World's Largest Builder of a Complete Line of Lathes for More than 71 Years

designed for...
BARBER
COLMAN

. . . precision instrument gears

new Barber-Colman hobber guaranteed to index accurately within 20 seconds of arc

Barber-Colman engineers have developed a new hobbing machine which guarantees indexing accuracy suited to gears used for aircraft, missile and radar guidance systems. This machine is known as the No. 2½ - 4 hobbing machine and hobs precision spur gears up to 2½" diameter x 4" length, 30 D.P. in steel and 20 D.P. in brass. It provides accuracy, capacity and rigidity for precision fine-pitch work within a nominal price range.

One of the most important features of the new No. 2½ - 4 hobbing machine is the accuracy of relative rotation between the work spindle and the hob spindle which is guaranteed within 20 seconds of arc. This means that the spacing error on the gear caused by the indexing error of the machine would not exceed .00014" on a 2½" diameter gear.

The machine has a capacity for using 3" diameter hobs providing for a greater number of flutes to produce smooth gear tooth profiles. Using proper care in rigid tooling, accurate blanks, mounting of hob and work, and Class AA hobs with accurate sharpening, precision gears to Class 3 tolerances are hobbed with this machine.

Several design features are a departure from standard hobbing machine construction. There is no hob slide — only a hob carriage for conventional feed. In place of a hob slide, the hob arbor is mounted on a swivel which adjusts to compensate for hob thread angle. The work slide is stationary, and the hob swivel raises and lowers to meet diameter requirements. The machine has no overarm support, permitting greater work visibility and operator access. Both work and hob spindles are mounted in precision anti-friction bearings to provide accurate rotation at high speeds. The hob carriage also has anti-friction way supports, and the metal-to-metal contact afforded provides more rigidity than obtained with gib-type mounting. An infinite number of hob speeds are provided without change gears in the range of 200 to 1200 r.p.m.

Rigidly constructed, with a steel weldment base and heavy grey iron machine bed, the machine is designed with a minimum number of parts at points where deflection and inaccuracies may occur. Net machine weight without tooling is approximately 1500 lbs. Standard equipment includes motor and controls and one set of change gears.

For complete specifications and data contact your nearest Barber-Colman representative, or write directly to the factory for a copy of new bulletin F-8642. Orders are now being booked for July and August deliveries.

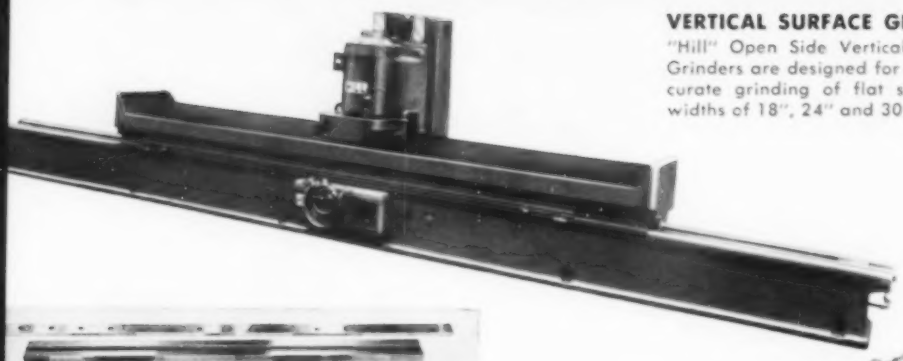
BARBER-COLMAN COMPANY

713 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

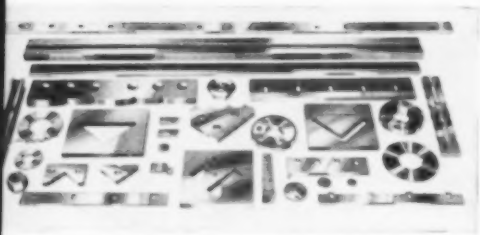
BARBER COLMAN

HILL ACME



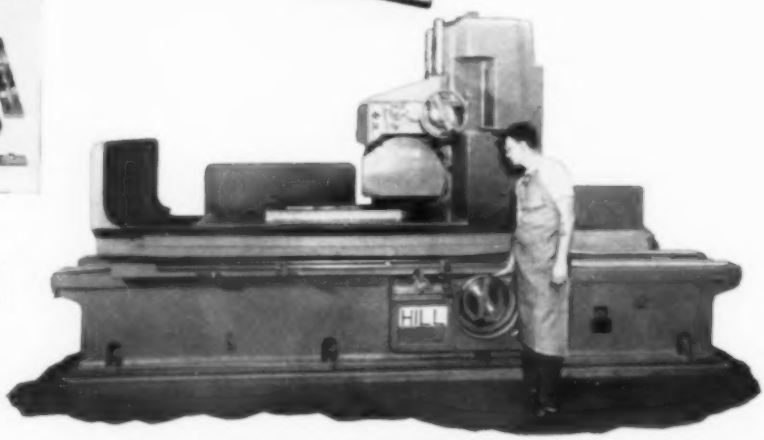
VERTICAL SURFACE GRINDERS

"Hill" Open Side Vertical Spindle Hydraulic Surface Grinders are designed for rapid stock removal and accurate grinding of flat surfaces. Furnished in table widths of 18", 24" and 30"; table lengths 60" to 240".



SHEAR KNIVES

"CLEVELAND" Knives and Shear Blades. Solid and laid steel shear blades; rotary slitting and side trimming knives; metal cutting machine knives.



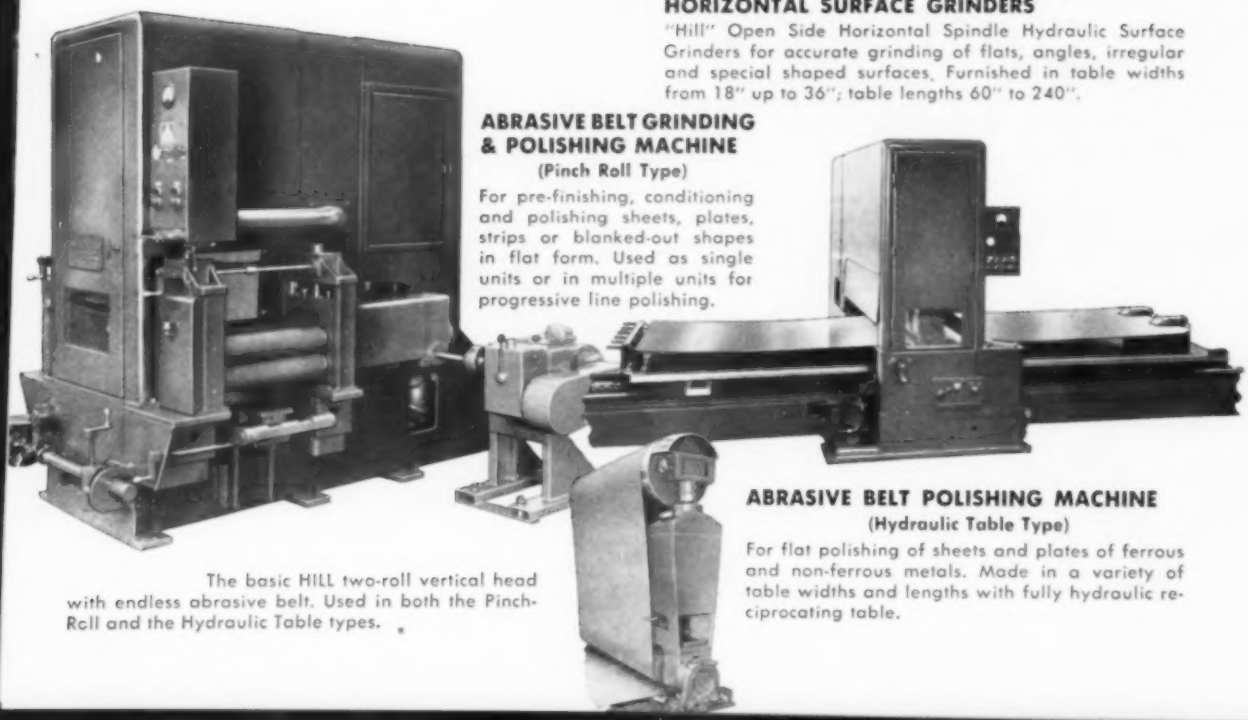
HORIZONTAL SURFACE GRINDERS

"Hill" Open Side Horizontal Spindle Hydraulic Surface Grinders for accurate grinding of flats, angles, irregular and special shaped surfaces. Furnished in table widths from 18" up to 36"; table lengths 60" to 240".

ABRASIVE BELT GRINDING & POLISHING MACHINE

(Pinch Roll Type)

For pre-finishing, conditioning and polishing sheets, plates, strips or blanked-out shapes in flat form. Used as single units or in multiple units for progressive line polishing.



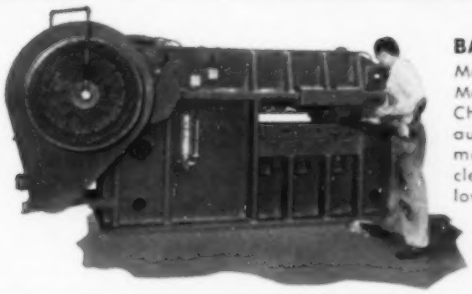
The basic HILL two-roll vertical head with endless abrasive belt. Used in both the Pinch-Roll and the Hydraulic Table types.

ABRASIVE BELT POLISHING MACHINE

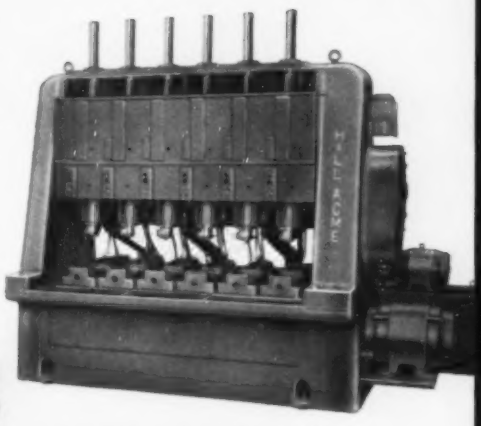
(Hydraulic Table Type)

For flat polishing of sheets and plates of ferrous and non-ferrous metals. Made in a variety of table widths and lengths with fully hydraulic reciprocating table.

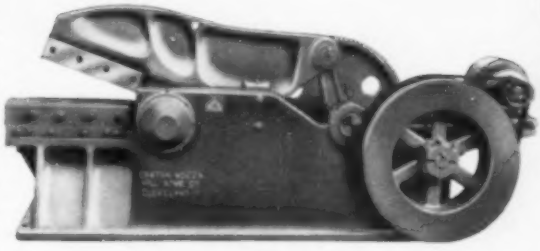
Tools for Industry



BAR-BILLET SHEARS
Modern, efficient design. Made in 3" to 6½" sizes. Choice of hand, semi-automatic or fully automatic feed. Assures clean, square cuts with low maintenance.

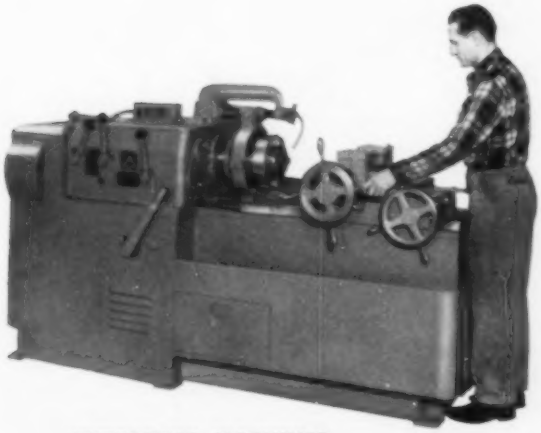


ALLIGATOR SHEARS
"CANTON" Alligator Shears are the most rugged, powerful and trouble free shears ever built for processing scrap. Modern design has produced a stronger shear, with fewer parts, and positive lubrication. Made in a full range of sizes to meet every condition.

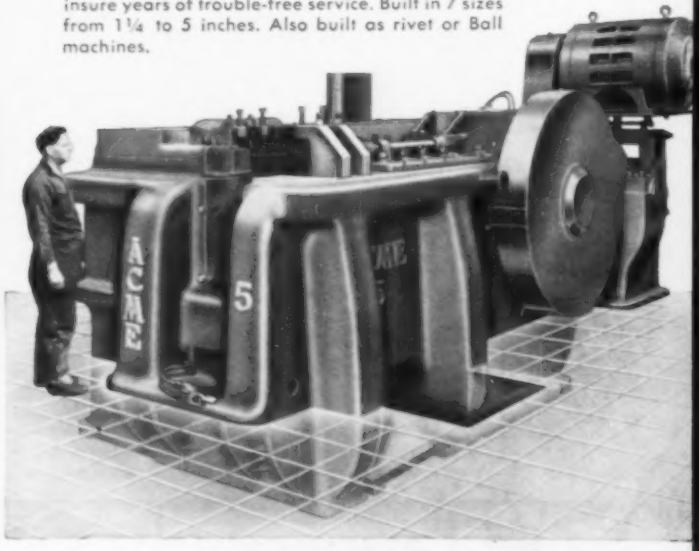


TAPPING MACHINES
"ACME" model XC-W six spindle Coupling Tapper. Built in 1" capacity and larger, in 6 or 8 spindle. Can be adapted as a nut tapper.

FORGING MACHINES
"ACME" XN Forging Machines produce accurate, quality forgings for long uninterrupted periods. Massive construction and simplicity of operation insure years of trouble-free service. Built in 7 sizes from 1¼ to 5 inches. Also built as rivet or Ball machines.



THREADING MACHINES
"ACME" HA Single and Double Spindle Threading Machines are equipped with tangent or hob type die head which assures economical, accurate, high speed production. Furnished in sizes from 1" to 2½" capacity.



THE HILL ACME COMPANY

1201 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

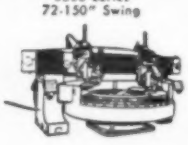
Frauenthal *1200 Series*

☆ single spindle vertical precision grinders

Bird's-eye view of a new Frauenthal 1200 Series (belt-driven) single spindle, vertical precision grinder. These versatile machines are designed to meet a broad range of present requirements . . . are readily adaptable to future requirements.

F **PRECISION PRODUCTION VERSATILITY**

2200 Series
72-150" Swing

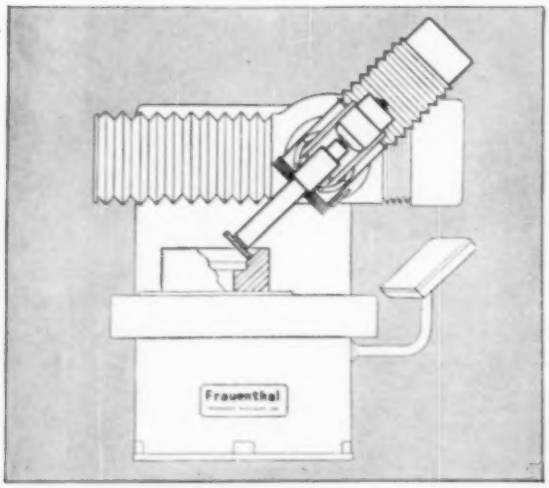


1800 Series
60-72-84" Swing

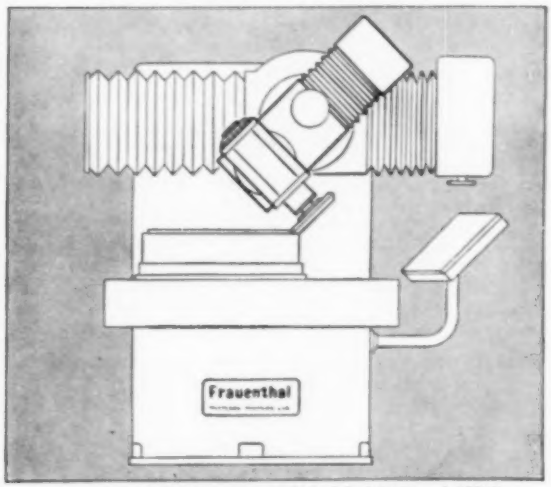
3100 Series
60-72-84" Swing

creatively engineered

...accuracy to .000100" at spindle nose



Frauenthal belt-driven Model 1224B and 1236B single spindle, vertical precision grinders have an extreme angle setting of compound at 45°. Versatility such as this permits angle, internal, external and face grinding to millionths-of-an-inch related tolerances.



Frauenthal direct-connected Models 1224D and 1236D are ideal for rotary surface grinding, O.D. surface and angular approach grinding operations. A variety of grinding spindle positions is possible with this head arrangement.

assures uniform, super-precision part after part!

Super-precision is the natural result of overall Frauenthal single spindle, vertical precision grinder rigidity; of proven performance . . . and *continuous* application of advanced grinding techniques.

These new Frauenthal 1200 Series machines are available with choice of belt-driven or direct-connected grinding spindles. Machines with either spindle arrangement are offered with 24" dia. tables x 36" swing and 36" dia. tables x 48" swing capacities inside splash guards. Additional swing can be obtained by removing guards.

Write for free Bulletin

1200 Series
36-48" Swing

Special Grinding Machines using standard Slide Units

Frauenthal Division
THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN, U. S. A.

ARMSTRONG

The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

Write for catalog

Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Save: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds—produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market . . . are used by over 96% of the machine shops and tool rooms . . . are carried in stock for your convenience by all industrial distributors of consequence.

Buy **ARMSTRONG TOOLS** from your Industrial Distributor

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"*
5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

NEW! from Erie Foundry Co.

Mechanical Forging Press

By eliminating the conventional pitman, Erie's new mechanical forging press is rugged, more rigid, and more compact. Guiding is unusual, too.

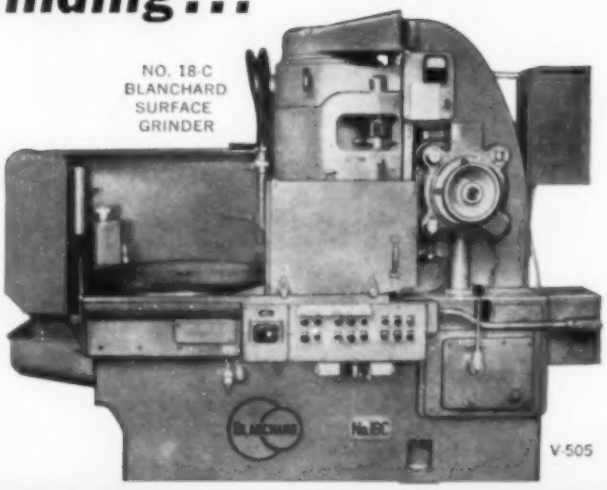
You are invited to see this press in operation at the Erie Foundry plant. Please call or write Mr. Claude L. Boring, General Manager, for an appointment.

Greatest name in forging machinery—Since 1895

ERIE FOUNDRY CO.
ERIE 4, PA.

For better, easier grinding...

Whether you're "hogging" off stock from rough castings or precision grinding to a tolerance of ±.0005", you can do it better and easier with the Blanchard No. 18-C Surface Grinder. Once the work is set up, the automatic cycle handles every operation from start to finish. The operator is free to prepare the next load of work or to operate a second No. 18-C Grinder.



Cast Iron Plate. Blanchard ground at the rate of 30 pieces – 60 surfaces – per hour. Stock removal ⅛" each side.

Steel Bars. Blanchard ground at the rate of 48 pieces – 192 surfaces – per hour. Stock .040"-.045" from each side. Limits ±.001" square, flat and parallel.

Hot Rolled Steel Cams. One operator and one No. 18-C Blanchard produce 225 pieces – 450 surfaces – per hour. Stock removal 1/32" each side. Limits ±.001".

just push a button...

- Automatic size control to ±.0005"
- Duplication of repetitive loads
- Pre-set "spark out" time for flatness and surface finish
- No more "operator worry" on close work – greatly reduced fatigue
- A large part of operator's time available for
  - (a) Handling or slushing work pieces
  - (b) Filing burrs
  - (c) Selecting correct wheel and preparing for next job
- Specially-designed sizing device with built-in feature to compensate—automatically—for wheel wear during grinding cycle.

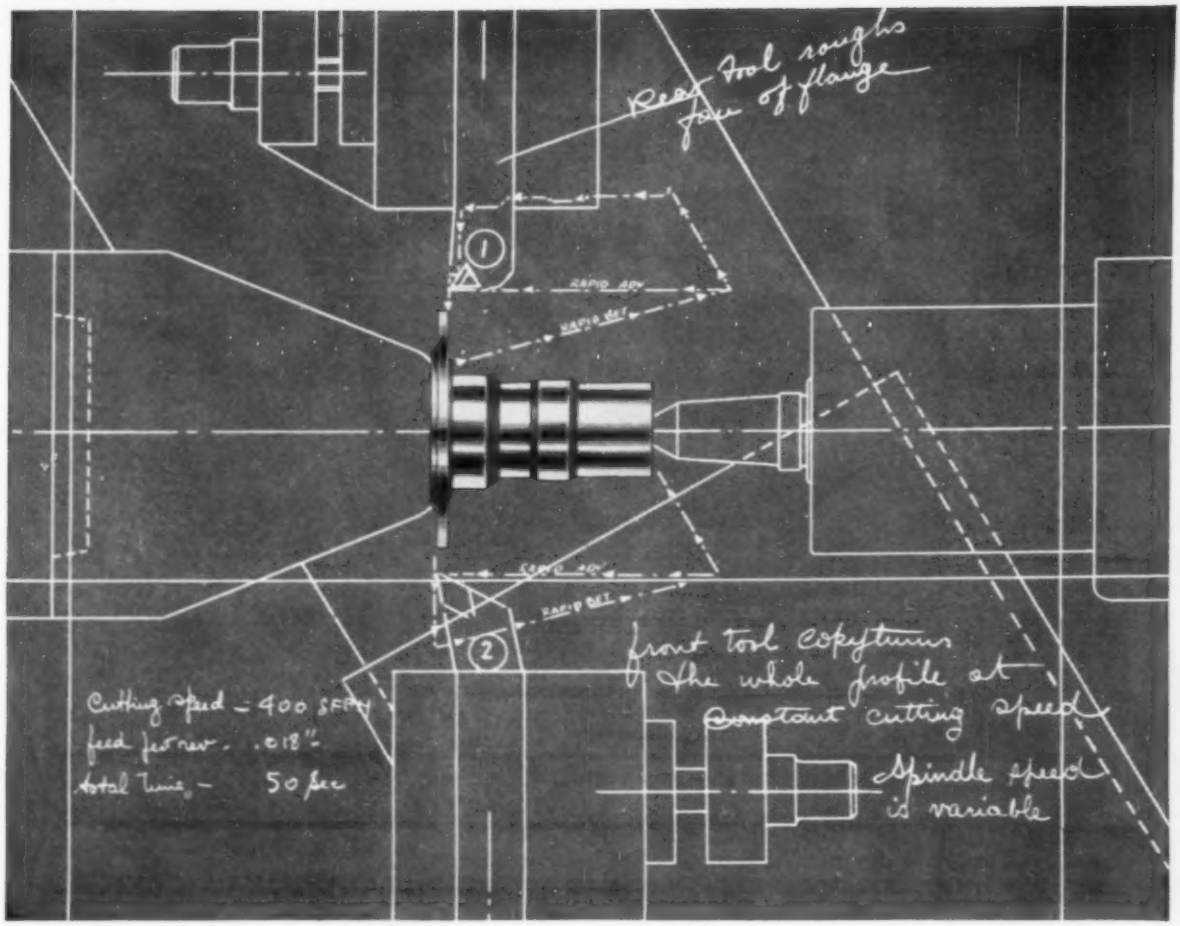
All of these features give you *more efficiency at reduced costs!*

PUT IT ON THE BLANCHARD

Send for your free copy of Model 18-C folder.

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

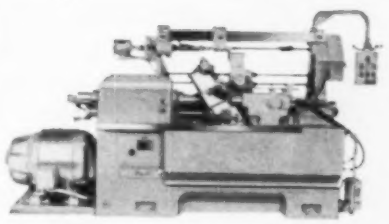

Rear tool roughs face of flange
RAPID ADV
RAPID RET
SERVO ADV
RAPID RET
Front tool copyturns the whole profile at constant cutting speed
Spindle speed is variable
Cutting speed – 400 SFPM
feed per rev. – .018"
total Time – 50 sec

In 50 seconds

the Conomatic Pilot copyturns this entire profile at constant cutting speed

The Conomatic Pilot is the only multicycling copying lathe that provides constant feed per revolution by means of a piloted hydraulic feed—an important reason why you can profile turn parts like this to very close tolerances on all surfaces at full production speeds. When used for finishing only, the Conomatic Pilot can often eliminate green grinding operations.

Write today for details of the Conomatic Pilot lathe.



The Conomatic Pilot Model KU is a hydraulically-controlled multicycling copying lathe that can automatically reproduce practically any profile, using a motorized rotating template. It can be adapted to a wide variety of slides and tool stations.

Conomatic

CONE AUTOMATIC MACHINE CO., INC., WINDSOR, VT.

PILOT DIVISION

30 Rockefeller Plaza, New York 20, N. Y.

be a Profit prophet ...without Crystal Ball!

Users of U. S. Adjustable Drill Heads are unusually accurate in anticipating profit pictures— they regularly figure lower and *more dependable costs.* That's because these high-quality heads—priced right to start with—usually cost less to maintain, less to operate.

The U-1 Head shown has 8 drivers, ¼" drilling capacity in cast iron, 6" diameter drilling area. With 2 spindles and Erickson chucks, it costs only $260.

And that's because ALL U. S. Heads of this type have these plus features:

SHAVED GEARS for smooth, quiet operation.
SPECIAL UNIVERSALS with heat treated joints, neoprene sealed and lubricated for life.
ALUMINUM BODY CASTING with special 33,000 lb. tensile.
GREATER BEARING AREA for the spindles.
QUICK CHANGEOVER for different hole patterns.
SLIP SPINDLE PLATE, providing the advantage of a fixed center head on long runs.

Write for catalog AD-57. Immediate delivery on most standard sizes.

Adjustable and Fixed Center Multiple Drilling Heads
Individual Lead Screw Multiple Tapping Heads

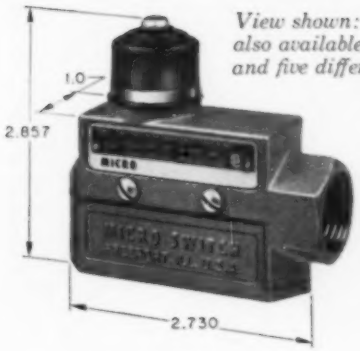
US DRILL HEAD

UNITED STATES DRILL HEAD CO.

BURNS STREET • CINCINNATI 4, OHIO

MICRO SWITCH Precision Switches

NEW! . . . A new housing for the widely used "E" and "V" series provides Easier Installation . . . a Better Seal . . . and Better Insulation



View shown: side mounting; also available with bottom mounting and five different actuator designs.

This new housing replaces the one formerly used in the "E" and "V" Series and is known as the "E6" and "V6" Series. The new series is interchangeable with the old series.

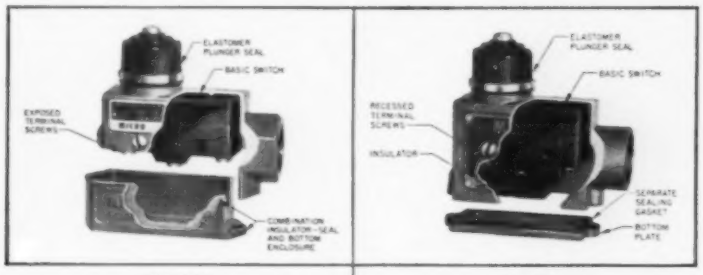
The new "E6" and "V6" have these outstanding advantages:

Easier Installation. Terminal screws now project from top portion of housing instead of being recessed in a cavity, thereby making easier installation.

Improved Insulation. A one-piece moulded neoprene insulator-seal, cemented into lower portion of housing replaces the separate, wrap-around Fiberglas insulator and separate gasket.

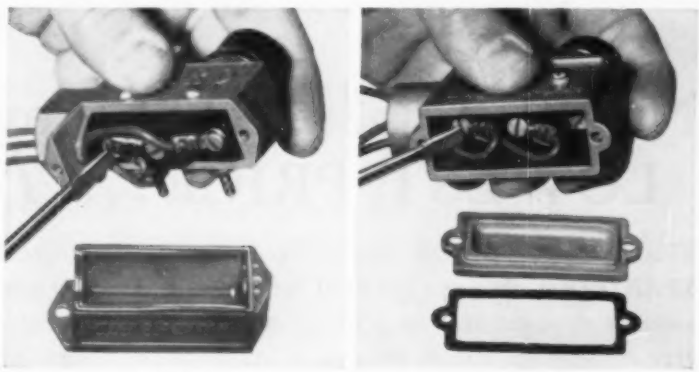
Rugged–Heavier Walls. The new, two piece housing has heavier walls—a hex-shaped conduit hub instead of round. A much cleaner, stronger design.

Interchangeable with old series. Dimensionally the same as old series—same mounting holes, same width, height and depth. Compact—fewer parts.



NEW OLD

Compare these two cut-away views. Note how terminal screws in the new "E6" Series project from the bottom of the top portion of the housing; how the insulator and seal are one moulded neoprene piece, cemented into the bottom part of the housing.



NEW OLD

The new series design can be installed in jig-time. No deep cavity in which to fumble with a screw-driver, no fold-in insulator, no jiggling with a separate sealing gasket.

For complete details of this new series write for Data Sheet No. 145.

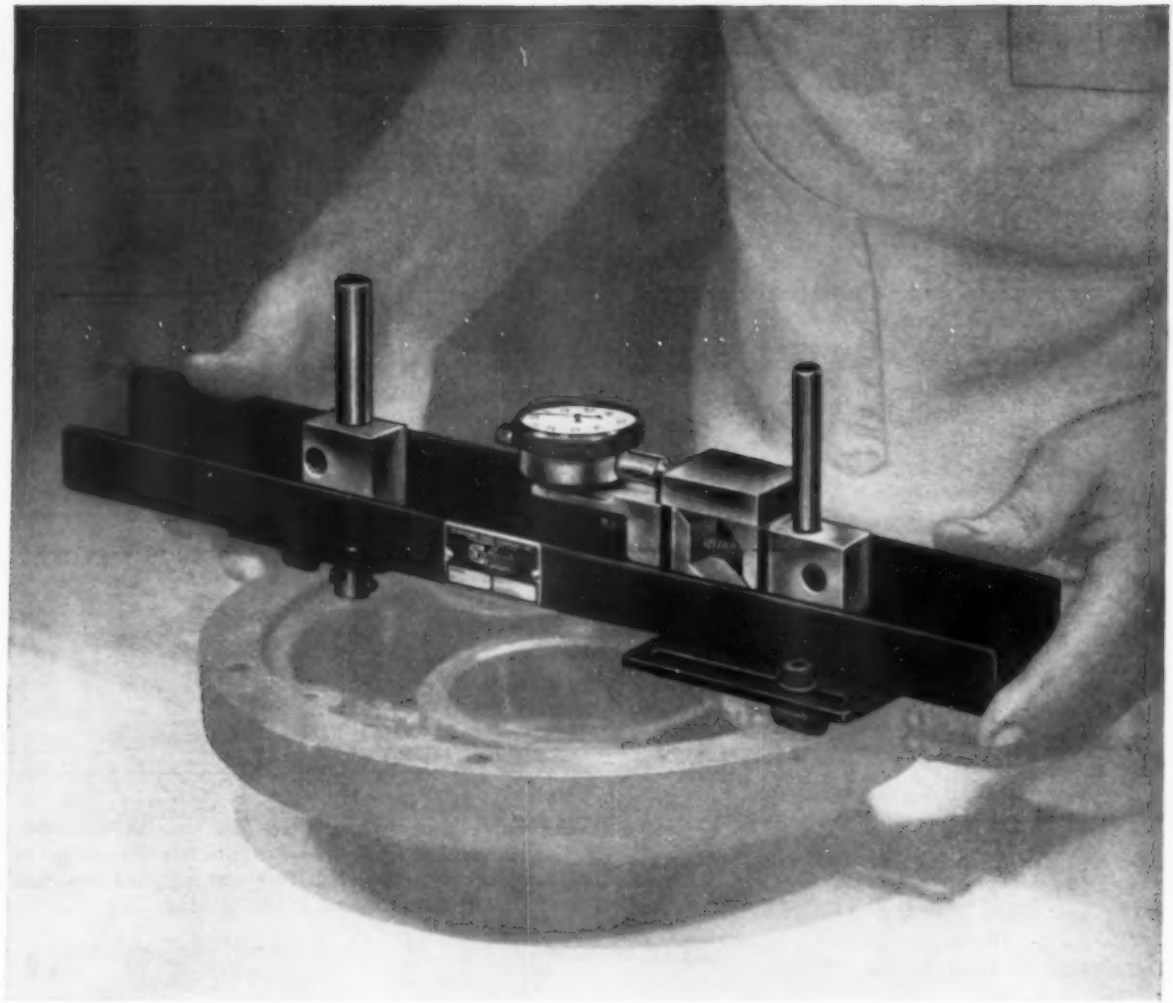
The two word name "MICRO SWITCH" is NOT a generic term. It is the name of a division of Minneapolis-Honeywell Regulator Company.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

First in Precision Switching



NOW! *Adjustable* Shallow Diameter Gages LOWEST PRICE . . . *"Tenth"* Accuracy

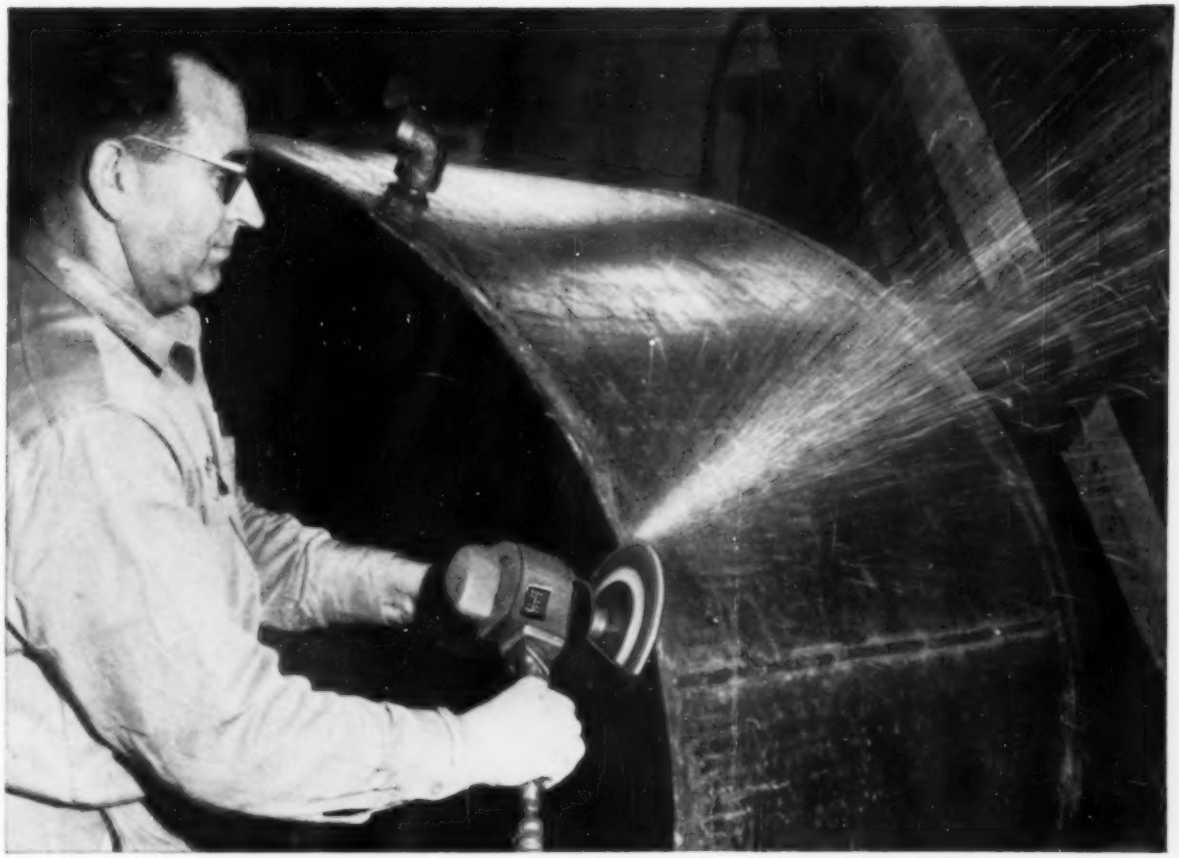
This new, multi-purpose, multi-range series *by STANDARD* obsoletes the need for expensive, specially designed shallow diameter gages. *New type* reed-linkage insures positive, accurate transfer of movement from contact point to indicator.

Gages are easily set to regular adjustable masters or with gage blocks and parallels. Tail and head assemblies are interchangeable between frames of different lengths. Smallest size permits checking I.D's or O.D's down to 4″ and depth adjustment permits easy measurement from 0″ to 2″ below supporting plane. Greater depth ranges if needed.

All this at *lowest price*. So, if your production includes any problems of shallow diameter gaging be sure to ask the *Man from Standard*. Or, write us right here at the plant.

STANDARD® GAGE COMPANY, INC.
SINCE 1925
POUGHKEEPSIE, N.Y.

A COMPLETE LINE OF GAGES . . . INDICATING, FIXED AND ADJUSTABLE TYPES



PAID OFF in 13 weeks

JOB: Smoothing edge of plate after flame-cutting. Grinding time with tool formerly used—*2 hours*. Rotor Application Engineer recommended the *right tool*—a Rotor B-7SS* Vertical Grinder and Sander.

RESULT: Grinding time now 1½ hours—a savings of $20.25 per 40-hour week. Fast, light (6¼ lbs.) Rotor B-7 gives better finish, reduces operator fatigue.

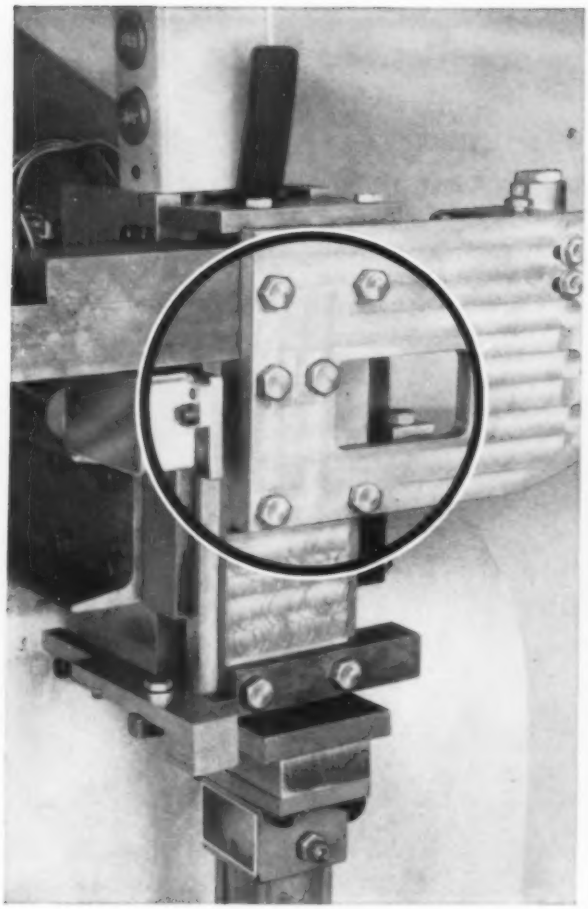
ASK FOR DEMONSTRATION of this lightweight, power-packed grinder or other Rotor Tools for *your* jobs. Write for Bulletin 56 on Vertical Grinders. The ROTOR TOOL Company, Cleveland 32, Ohio.

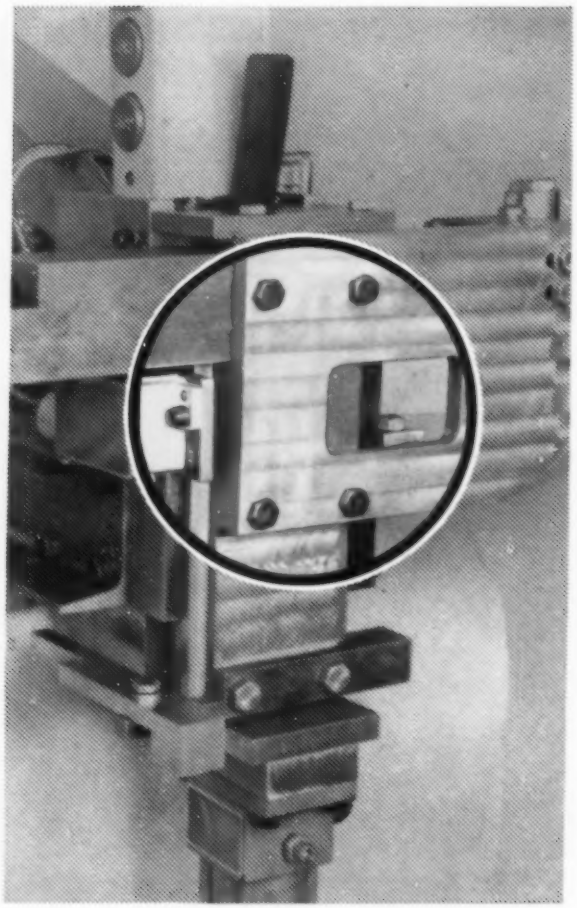
*B-7 with Safety Snap Throttle Handle

Here's the RIGHT TOOL for YOUR job!

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

ROTOR TOOLS
CLEVELAND, OHIO





Cuts fastener costs 37%
with CHICAGO heat-treated cap screws

Six ¾" bright cap screws were being used for the support plate assembly of this automatic transfer mechanism. CHICAGO's fastener specialists showed four 5/16" heat-treated cap screws would do the job more efficiently—eliminating two fasteners and substituting a smaller size.

Using heat-treated cap screws here cut total fastener costs 37%! And in eliminating two extra fasteners, important additional savings were made by reducing machining and assembly time.

It will pay you to investigate savings for your products with these stronger fasteners. In addition to their greater strength, CHICAGO heat-treated cap screws provide extra advantages of Carbon Restoration—the special, scientifically controlled process which assures superior resistance to fatigue, wear, shock, and vibration.

Your CHICAGO distributor carries large stocks of heat-treated cap screws. And he will gladly arrange a study of your particular application by our fastener specialists. Call him today.

It pays to standardize on CHICAGO FASTENERS

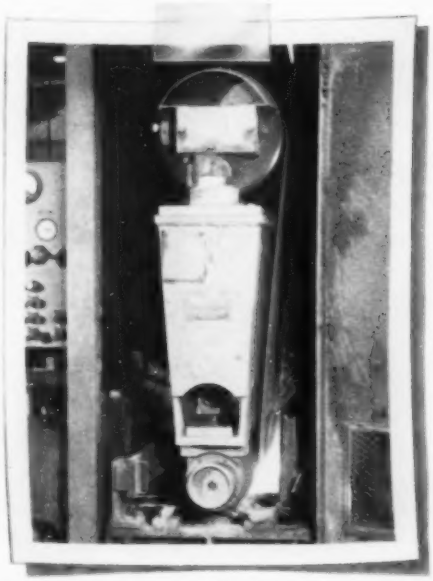
THE CHICAGO SCREW COMPANY

ESTABLISHED 1872 • DIVISION OF STANDARD SCREW COMPANY

2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

A 3M Case History Report

GRINDING PRODUCTION INCREASED 10% WITH 3M ABRASIVE BELTS



MANUFACTURER: Houdaille Industries, Inc.

ADDRESS: Huntington, W. Virginia

PRODUCTS MANUFACTURED: Auto Bumpers

HOW 3M ABRASIVES ARE USED: "PRODUCTION" Brand Paper Belts are used to pre-finish hot-rolled steel alloy sheets prior to forming and plating.

OPERATIONAL DATA ON 3M METHOD: 3M Paper Belts in grits 80, 100, and 150 are used on a 12-head fully automatic sheet-polishing line. New and used belts are alternated in a specific sequence to get maximum belt life and best finish.

PROVEN ADVANTAGES OF 3M METHOD: Customer's own tests established a 10% increase in production using 3M belts. 3M has been selected as major supplier on the basis of this, plus consistent quality and expert engineering assistance provided.

OTHER 3M ABRASIVE PRODUCTS IN USE: "TRI-M-ITE" Resin Bond Cloth "PG" Wheels; "Three-M-ite" Resin Bond Cloth Belts, and 3M Type "C" Fibre Discs are used for occasional clean-up and blending operations.

WANT MORE INFORMATION? Send for free manual, "Finishing Steel with 3M Coated Abrasives". Write to 3M Co., St. Paul 6, Minn., **Dept. AK-38.**

"PRODUCTION," "TRI-M-ITE," and "THREE-M-ITE" are registered trademarks of 3M Company, St. Paul 6, Minn. Export: 99 Park Ave., New York. Canada: London, Ontario.

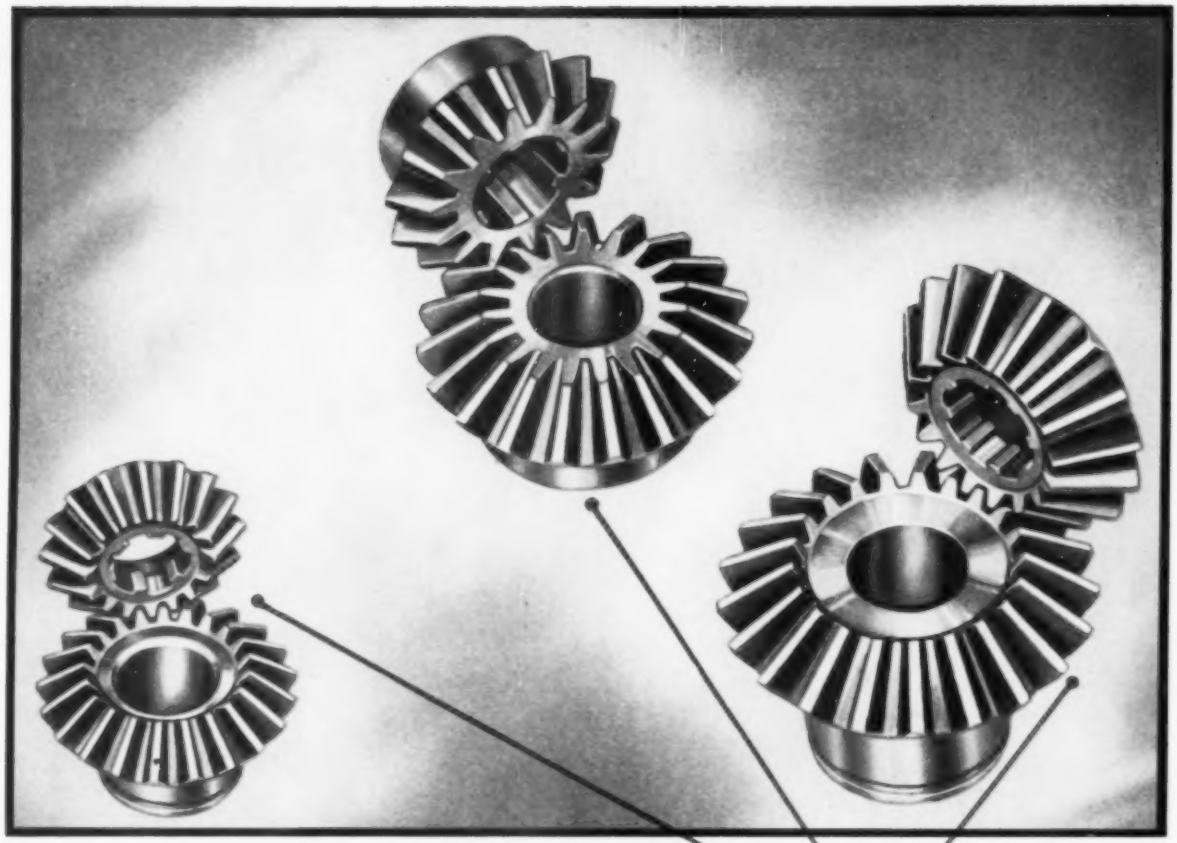
3M Coated Abrasives

"PRODUCTION" PAPER BELTS

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY



Shortest way to better production, smoother product performance: G.S. Bevels

FRACTIONAL HORSEPOWER GEARING

GEAR Specialties, Inc.

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CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

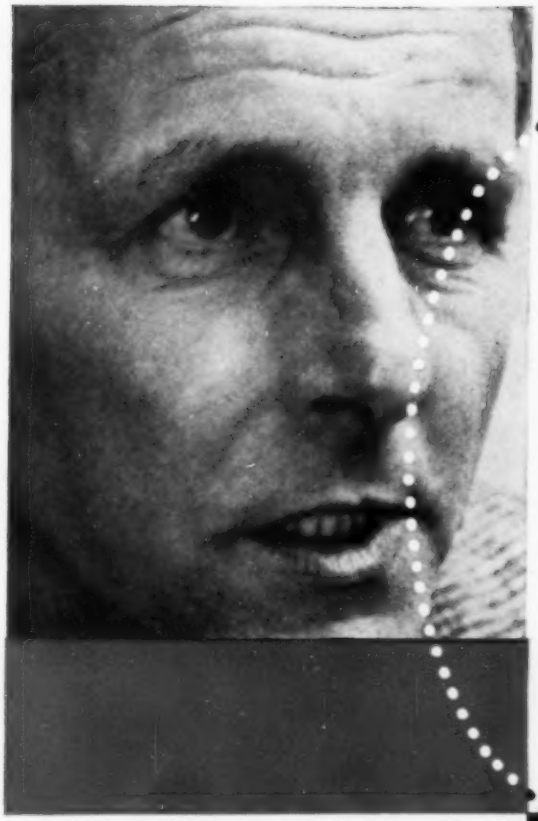
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

Nobody argues with the old axiom, "Time is Money"—and it's more and more costly to have assembly operations interrupted or slowed down by ill-fitting or defective parts. G.S. customers (whose roster reads like a Blue Book of American industry) don't worry about such problems. They've learned that they can rely on famous G.S. precision manufacturing methods and rigid inspection systems for Small Gearing made *right*, every time—Gearing which meets demanding specifications, makes assembly smoother, gives efficient performance in product use.

Perhaps you use full-generated and hardened Straight Tooth Bevel Gears cut from alloy steels, like those illustrated (they're used in outboard motors). Perhaps you need Spiral Bevels or Zerols. Whatever your requirements for Bevel Gearing, including Helicals, Internals or other types, G.S. engineering and G.S. quality belong on your production team!

SEND FOR *G.S. technical data, free! See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant view, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!*

42 Years of Specializing in Small Gearing!



"I'll pay for this drill only **once**...it costs less to buy accuracy **before** installation!

I pay for quality and accuracy at the start, then make my savings through lower costs per job. And, it's much easier to get jobs when costs aren't loaded with a lot of expensive down-time and rehandling."

It's a better buy... right across the production board!

CINCINNATI-quality...

GENERAL PURPOSE Royal Drills—16" size with 5/8" capacity, 18" with 1" capacity. Standard bench and floor models, and production bench types.

SLIDING HEAD Drills—16" and 24" Medium Duty bench and floor types with 1" capacity; 21" and 25" Heavy Duty floor type with 1½" capacity. Conventional drive, or INFISPEED variable speed drive.

STATIONARY HEAD Drill—Economical 21" floor model with 1½" capacity.

RADIAL Drill—3' Arm 7½" Column model with 1¼" capacity. HARDCLAD® flame-hardened column.

Contact your CL&T Dealer, or write us direct for catalogs on the drill types you need.

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CINCINNATI LATHE AND TOOL CO.

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NEW GULFCUT

HEAVY DUTY SOLUBLE OIL

for heavier cuts—at higher speeds—with longer tool life—even in turning chrome-nickel steels and other tough alloys!

Here are some of the first reports from the field on the performance of Gulfcut Heavy Duty Soluble Cutting Oil:

- "We grind twice as many pieces before wheel dressing!"
- "We were able to substantially increase depth of cut."
- "We get tolerances of 6 microns, instead of 16!"
- "We have been able to increase boring speeds!"

GULFCUT HEAVY DUTY SOLUBLE OIL

increases the efficiency of a wide range of machining and grinding operations...because:

1. Its lubricating-cooling-protective properties meet the heavy duty machining needs of today.

2. It permits higher speeds, deeper cuts . . . gives finer finishes, longer tool life . . . offers greater protection against corrosion . . . helps eliminate rancidity!

3. It performs efficiently even when mixed 1 to 150 parts of water . . . and has exceptionally long service life!

This new Gulf product is a heavy duty soluble cutting oil with a petro-chemical emulsifier. Its applications include heavy hogging cuts, fast fine cuts, boring, and grinding of ferrous materials, tough alloys—such as titanium and chrome-nickel-moly steels—and soft, non-ferrous metals, such as aluminum.

Shop-proved Gulfcut Heavy Duty Soluble Oil won't separate or gum in wheels, slides or ways. It contains a potent rust inhibitor which provides greater protection against rust and corrosion. It has excellent emulsion stability even in hardest water. It has high surface-wetting properties for more effective cooling. It is anti-weld, anti-wear and anti-foam. Also contains an effective germicide to help eliminate rancidity and odor.

Get the full efficiency-economy story on new Gulfcut Heavy Duty Soluble Oil now! Call your Gulf Sales Engineer, at your nearest Gulf office, or mail the coupon.

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

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Yes! Send me illustrated bulletin on
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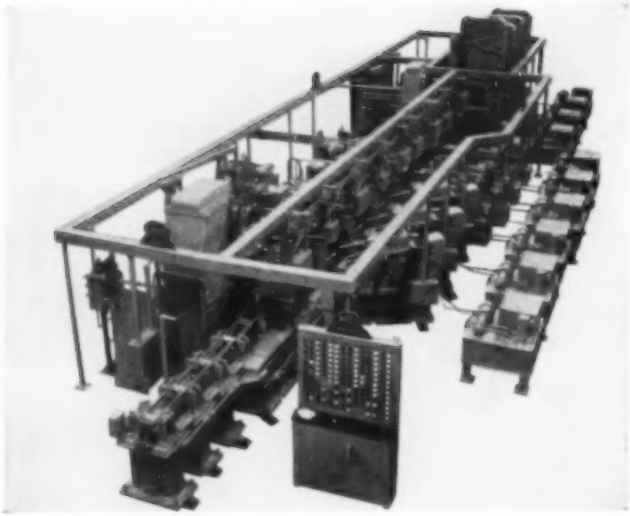
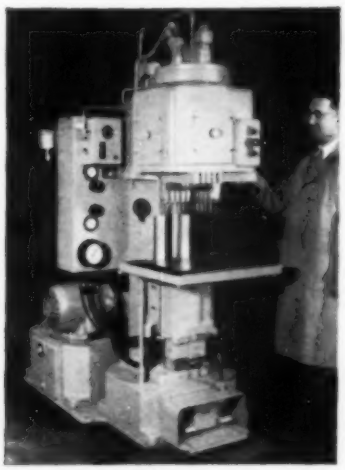
Only Builds



from transfer machines

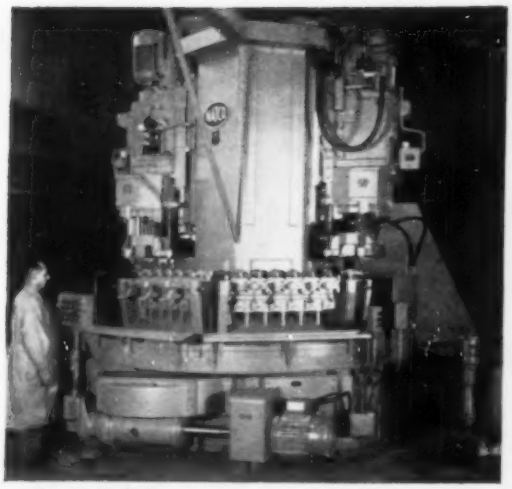
to small multi-spindles



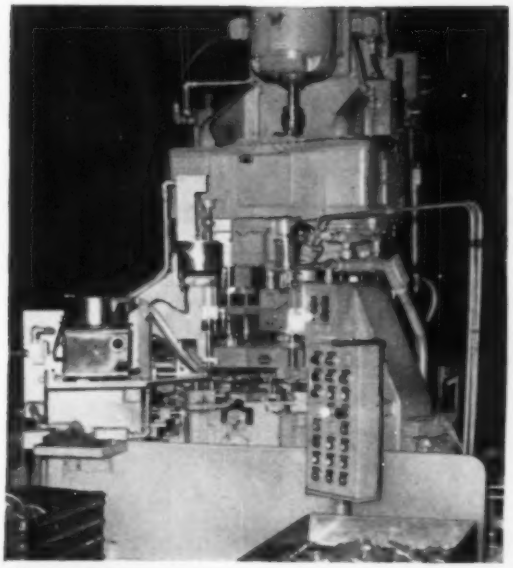
NATCO

Somewhere in Natco's experience is a money-saving idea for you!

Natco All Six

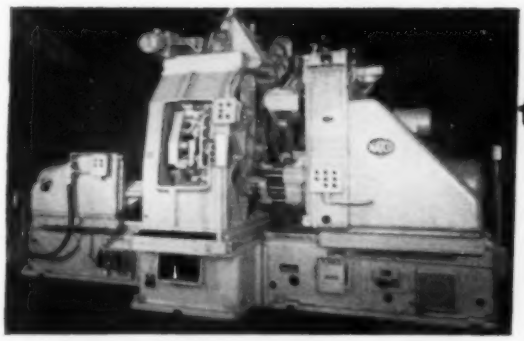


station



index

...and everything in between



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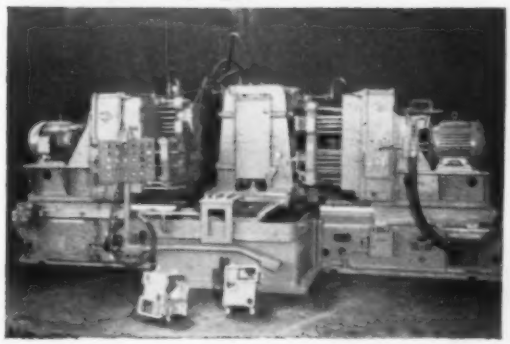

Drilling, boring, facing, tapping.

National Automatic Tool Company, Inc.,

Richmond, Indiana. Natco offices in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland and Los Angeles: distributors in other cities.

69.5 out of every 100 **GRAND RAPIDS SURFACE GRINDERS** sold, are purchased by firms already owning one or more — 30.5 by new customers.

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430 Straight Ave., S. W., Grand Rapids, Mich.

How Research Shapes Our Future Prosperity

If you are looking for an industry that is going to keep on booming in 1958 and every year for the next decade, here it is. It is the industry of technological innovation through research and development.

Last year this great new industry spent over $7 billion to discover and develop new industrial products, processes and equipment. This year the preliminary McGraw-Hill survey indicates that total expenditures for industrial research and development will be even greater, perhaps as much as $8 billion. Of the companies surveyed, 57% plan to spend as much as in 1957 and 38% plan to spend more.

The sustained expansion in research and development is the best guarantee we have that the current decline in business investment in new plants and equipment will be relatively short-lived. There can be no prolonged decline in investment in an economy where technology is changing rapidly.

This editorial is designed to show how the continued surge in research and development can be expected to lead first to new products, and eventually to renewed expansion of investment in new industrial plants and equipment. Such expansion is the essence of national economic growth.

A Slow Start

The impact of research on sales and investment is still very gradual. Research spending itself has more than doubled in the last four years. But only 32% of all manufacturing firms report significant capital outlays to make new products. We are not reaping the full dividends of industrial research as yet for several reasons:

- Research expenditures were relatively small until the Korean War of 1950 brought substantial government contracts in aviation, electronic and related fields. Heavy research outlays for civilian and industrial products came even later.
- There is an average *lag*, according to research directors consulted by the McGraw-Hill Department of Economics, of roughly seven years from the start of research until the product is ready for large scale output — about five years of research and at least two years to solve production problems and develop markets.
- Complex products, such as new consumer durables and industrial machinery, have an even longer time lag.

However, new developments are certainly underway. Research began to increase in all lines of business when Korean War restrictions and

the excess profits tax came to an end in 1953. The tax revision of 1954 added a new incentive by making research outlays deductible as a current business expense. By 1955, the research boom was on.

When Is The Payoff?

With a lag of about seven years, it will be the early 1960s before these new developments become a dominant factor in capital investment. But once the flow of new products and new processes starts, it will accelerate sharply — just as research spending has accelerated in the past few years.

By 1960, over $50 billion in sales will be coming from products not on the market as recently as 1956. Sales of new products will increase year by year, but they will gain most in 1960-1962, or five years after the recent spurt in research expenditures.

Capital expenditures to manufacture new products will also rise, but with a slightly longer lag. Here the sharpest rise should come in 1962-1965, as the new products reach a volume that calls for a significant amount of new capacity. In most cases, initial output of new products will come from existing capacity.

This timing of a new wave in capital investment appears logical on other grounds. Population experts forecast an upsurge in marriages and births around 1965. So by 1962, industry will be starting to tool up for new mass markets.

The important point is this: As we approach the 1960s more and more sales and investment will be in new products growing out of research. By 1960 well over 10% of manufacturing sales will be in new products not on the market in 1956.

Meanwhile — research will help stabilize capital spending by raising the level of modernization and replacement expenditures. Of course, research does not eliminate all the ups and downs in the demand for capital goods, for there remain variations in the amount spent to expand capacity. But a high level of modernization, to cut costs and improve quality, does put a floor under any drop in investment.

What To Expect

During the next few years we can expect an increasing flow of new materials, new metallic alloys, new machinery — primarily those developments coming out of long-established research programs in the chemical and electrical industries. Industry will make wider use of specialized computers and automated equipment.

But the dramatic payoff on research comes even later. In the early 1960s the consumer goods industries will begin tooling up for their really new products — things so basically new they can change the way a family lives. Such items as plastic houses, paper apparel, turbine autos are under development right now. But it will take several years to get costs down and for population and incomes to grow to the point where mass markets are created.

When we reach that point in the mid-1960s, there will begin the greatest surge of capital investment in all history. And then — around 1965 — the new processes (full automation, atomic power, continuous steel casting) which are the slowest and most expensive part of the research chain to develop, will come into play.

The combined impact of new products and new processes, to meet an expanding market, will thus be felt in the mid-1960s — eight to ten years after the recent sharp increase in research spending. The full impact is that far away because of the lags for applied research, pilot plant studies and market introduction. But to a large degree the prosperity of the 1960s has already been shaped by the research programs now underway.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT

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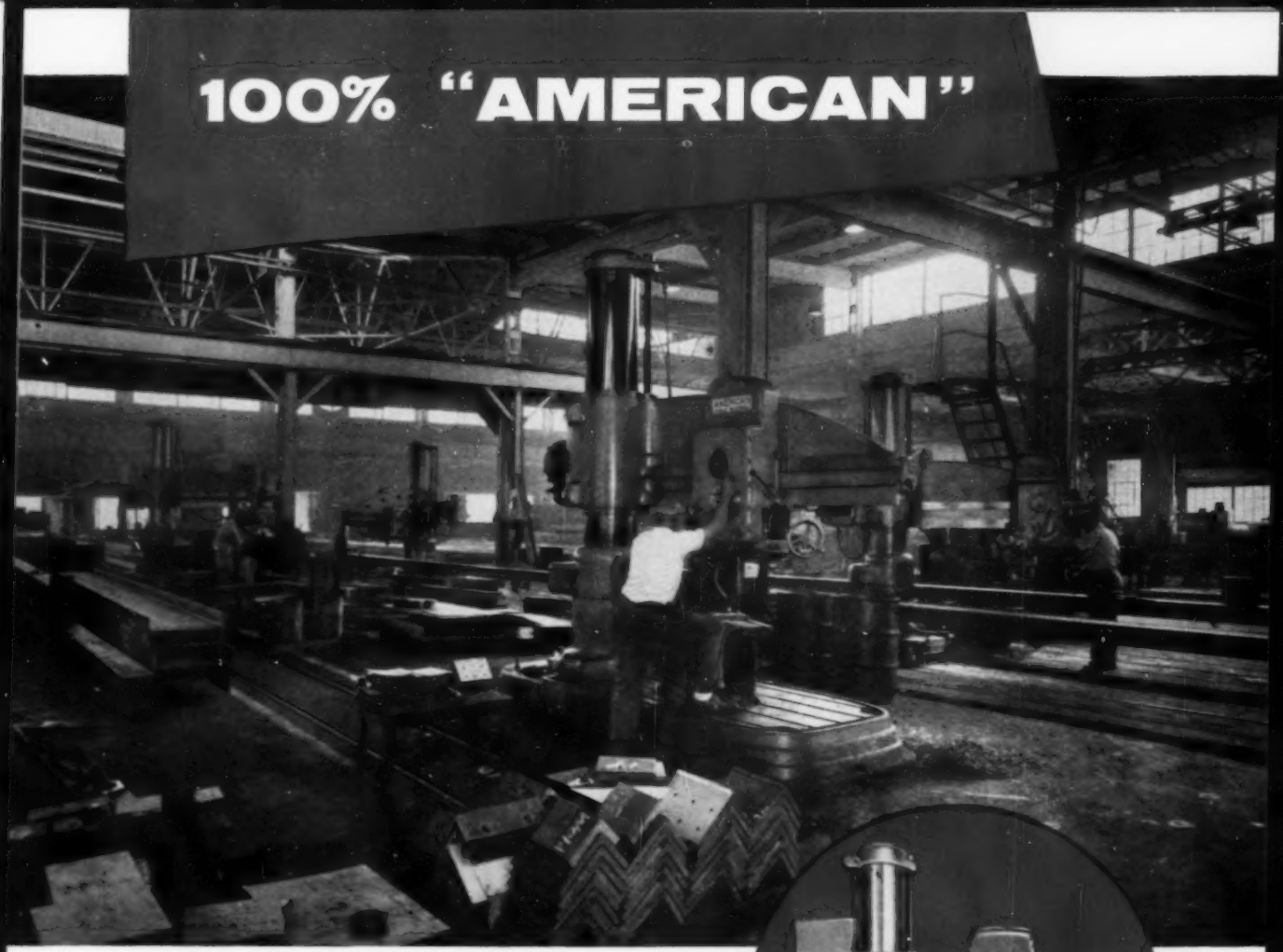
100% "AMERICAN"



The Stupp Bros. Bridge and Iron Company of St. Louis, Missouri, known the country over as one of the leading structural steel fabricators, use "AMERICAN" Radial Drills exclusively.

Mr. Erwin P. Stupp, President, gives as his reasons for his continuous selection of "AMERICAN"—

- EASE OF HANDLING
- RIGIDITY
- FAST MANIPULATION
- LOW MAINTENANCE

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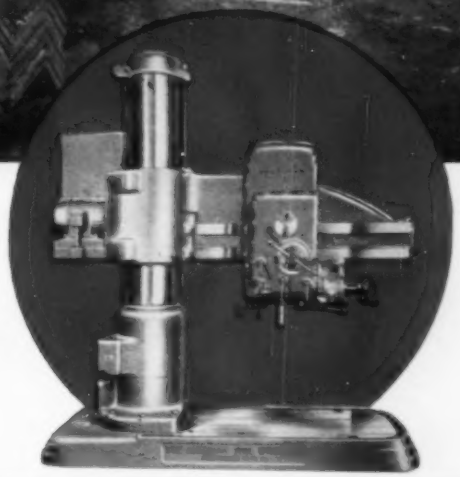
The half dozen "AMERICAN" Radials installed during the past 10 years are conclusive testimony to the satisfactory service afforded by these modern drilling, boring and tapping machines.



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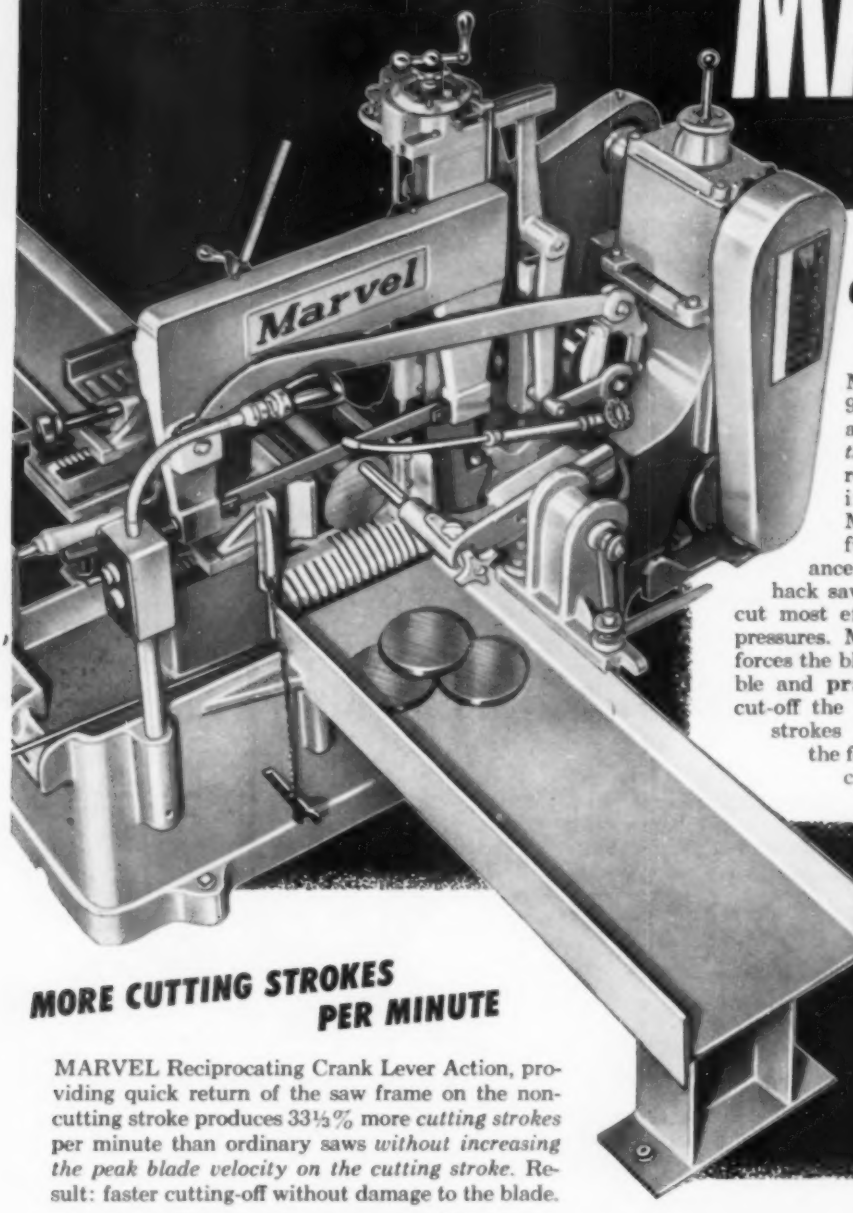
- Raybestos covered, spring steel tapping attachment friction bands, quick acting, wear proof, permitting 40% speed-up for spindle reverse.

Send for bulletin No. 328

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

How Can Any Hack Saw Cut As Fast As a MARVEL?



GREATER EFFECTIVE FEED PRESSURE

MARVEL Series 6, 6A, 9 and 9A Hack Saws are capable of automatically applying *more than twice the feed pressure* required for most hack sawing jobs. This means that MARVEL Saws can utilize the full strength and heat resistance of the modern composite hack saw blade which is designed to cut most efficiently under heavier feed pressures. MARVEL Dual Power Feed forces the blade to cut as deeply as possible and **practical** on every stroke—to cut-off the work in the fewest possible strokes by automatically adjusting the feed pressure in relation to the changing work resistance.

MORE CUTTING STROKES PER MINUTE

MARVEL Reciprocating Crank Lever Action, providing quick return of the saw frame on the non-cutting stroke produces 33⅓% more *cutting strokes* per minute than ordinary saws *without increasing the peak blade velocity on the cutting stroke.* Result: faster cutting-off without damage to the blade.

With far greater feed pressures automatically available, plus more cutting strokes per minute, is it any wonder that MARVEL Series 6 and 9 Hack Saws will give you faster, accurate cutting-off every time?

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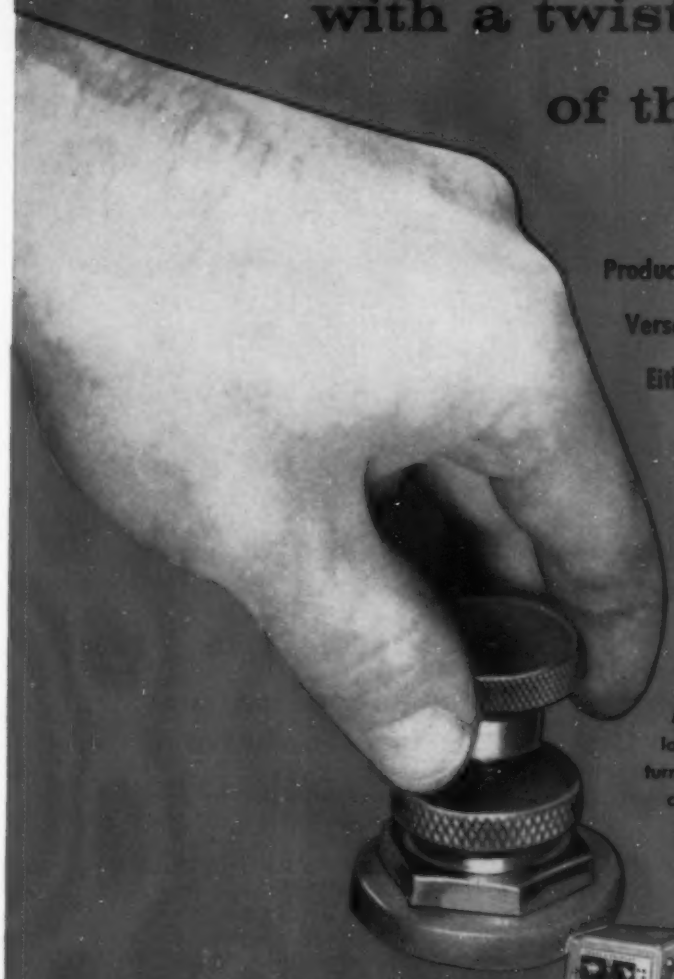
with a twist of the wrist



Productivity of a tracer lathe . . . .

Versatility of an engine lathe . . . .

Either instantly available!

Productivity by itself may cost money if you sacrifice versatility. But not with a Lodge & Shipley 90° COPYMATIC Lathe! This lathe combines COPYMATIC tracer control productivity with new POWERTURN engine lathe advantages. You get toolroom accuracy, engine lathe versatility and tracer lathe capacity without the high price tag you might expect.

Many COPYMATICS are used as engine lathes to produce a prototype part which, in turn, is used as a template for fast, tracer controlled production of the rest of the run. These lathes turn in records of production increases up to 536%, savings of 65% and more!

For eye-opening case histories, specifications, write:
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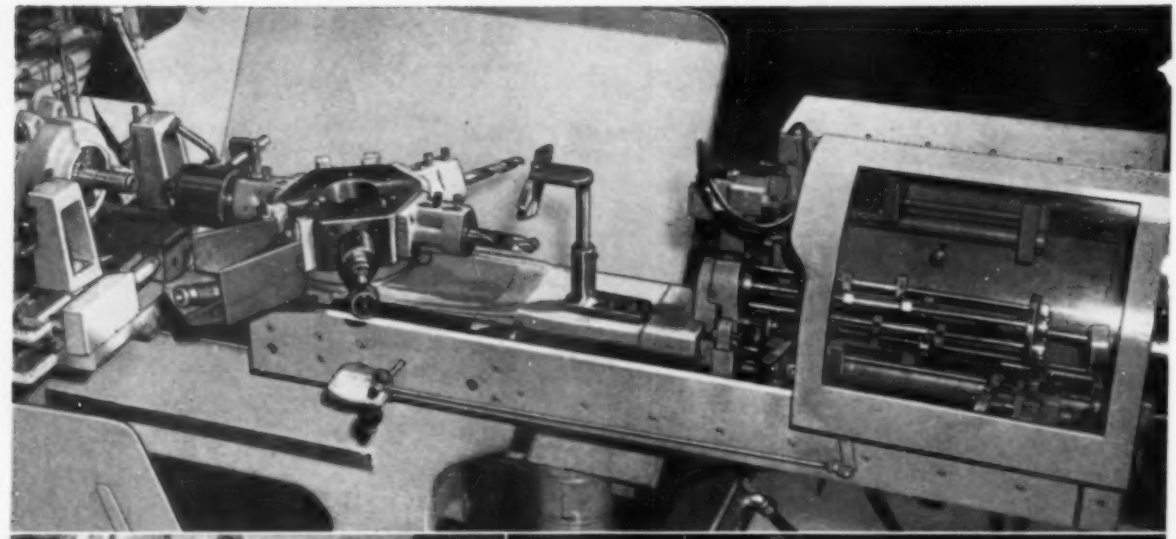

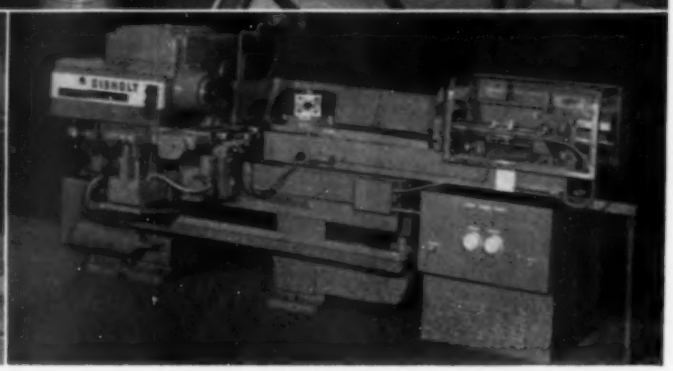

250% Production Increase with this setup

Gets full automation on small job-lot production runs using hydraulic drive on Gisholt Ram Type Turret Lathe

Floor-to-floor time on the job shown here—a threaded collar 3⅛" long with 1¹¹⁄₁₆" diam.—was cut from 8.1 minutes (with hand operation) to just 3.25 minutes. All operations and machine functions are automatically controlled with the Lynn Hydraulic Drive Unit on a Gisholt Ram Type Turret Lathe.

Here's how the finished workpiece is completely machined from bar stock in one fast, automatic operation: The stock is fed pneumatically against a turret stop, chucked, start-drilled, then finish-bored with a large drill. The hydraulic drive backs the drill out automatically to clear the chips, then rapid traverses back to where it left off before dropping into feed to resume drilling. Spindle speed automatically decreases as tools on the front cross slide form the O.D., drops into lower speed as O.D. is threaded, and into another low speed as radii are formed on the finished part and on the end of the bar stock. A tool on the rear cross slide cuts off the finished part and the job is done in record time.

With its massive design, reserve power and extra spindle speeds, the new Gisholt MASTERLINE Ram Type Turret Lathe is particularly adaptable to complete automatic operation with Lynn Hydraulic Drive. Contact your Gisholt Representative. He has the complete facts—and his wide experience may point the way to more profitable operation for you.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

WRITE GISHOLT TODAY for new Bulletin 1174-B, covering new MASTERLINE Ram Type Turret Lathe. Also new Catalog 1182-A on Ram Type Turret Lathe with Hydraulic Drive.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT FACTORY REBUILT MACHINES WITH NEW MACHINE GUARANTEE

Columbia Tool Steels for 1957-58
with A.I.S.I. Identification and Type Classification of Tool Steels

GRADE	Identifying Elements, in Per Cent										
	Type	C	Mn	Si	Cr	Ni	V	W	Mo	Co	Cb
HIGH SPEED TOOL STEELS											
TUNGSTEN BASE — TYPE SYMBOL T											
CLARITE	T1	.70	—	—	4.00	—	1.00	18.00	—	—	—
VANITE	T2	.80	—	—	4.00	—	2.00	18.00	—	—	—
	T3	1.05	—	—	4.00	—	3.00	18.00	—	—	—
ACMITE	T4	.75	—	—	4.00	—	1.00	18.00	—	5.00	—
COBITE	T5	.80	—	—	4.00	—	2.00	18.00	—	8.00	—
	T6	.80	—	—	4.50	—	1.50	20.00	—	12.00	—
	T7	.75	—	—	4.00	—	2.00	14.00	—	—	—
MAXITE	T8	.75	—	—	4.00	—	2.00	14.00	—	5.00	—
CARVITE	T9	1.20	—	—	4.00	—	4.00	18.00	—	—	—
	T15	1.50	—	—	4.00	—	5.00	12.00	—	5.00	—

Fourth of a Series of Six Charts Covering A.I.S.I. Tool Steel Type Classifications

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COLUMBIA TOOL STEELS

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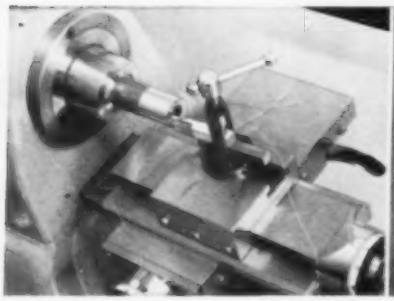
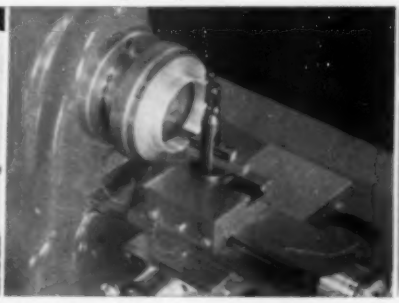
HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

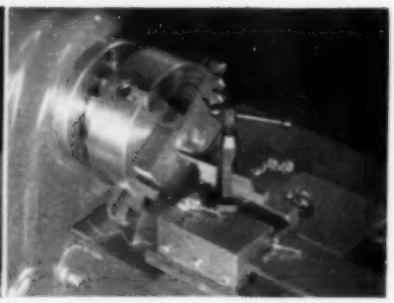
Correct Size - High Speed - Precision Results



Collet Work — The right machine for collet work of 1-1/16" or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".



Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".

SPECIFICATIONS:
1⅛" Collet Capacity
9" Swing
17" Center Distance
Infinitely Variable Speed
230—3500 r.p.m.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 3500 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease of operation assure precision results

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The shorter the distance the less cost. Butterfield taps save time and cut your product costs — giving higher production and quality products with Butterfield tools.

There are Butterfield warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York, San Francisco. Butterfield Division, Union Twist Drill Company, Derby Line, Vermont.

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...make the most of your product

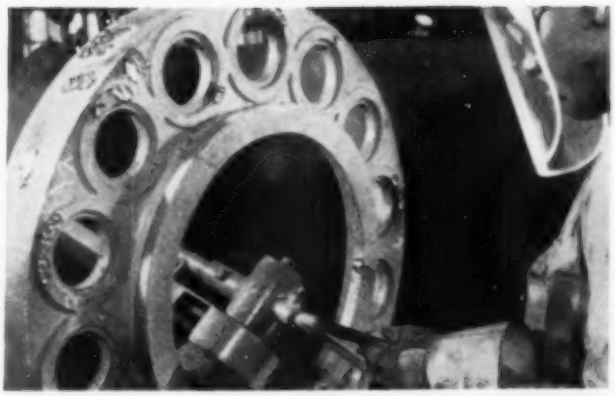
SEE YOUR BUTTERFIELD DISTRIBUTOR FOR PRECISION-MADE
DRILLS • REAMERS • TAPS • DIES • CUTTERS • END MILLS • HOBS • CARBIDE TOOLS

His new grinding technique cuts costs and back-aches

Problem: At Cooper Alloy Corp., some jobs just couldn't be done with big swing-frame grinders. Yet they were backbreakers when done with portables . . . expensive, too.

Solution: Bay State distributor Jack O'Sullivan, president of Engineered Sales Co., worked with Bay State and Fox Grinders, Inc. . . . devised a baby swing-frame. It used cup and raised hub disc-wheels normally used only on portables and enabled Cooper's operators to grind hard-to-reach surfaces without fatigue . . . and with much more speed and accuracy.

Like Jack O'Sullivan, Bay State representatives often come up with ideas that result in basic operating improvements. Why not call in *your* Bay State man? *Better grinding at lower cost—that is his business.*



New baby swing-frame takes weight load of portable grinder off operator . . . enables him to grind smooth, flat surface without accidental scars and nicks due to fatigue.

BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
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Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.

CLEVELANDS

automatically set the pace for progress!

Whitin Machine Works, Whitinsville, Mass., builders of textile preparatory machinery and other products, in part of a $4½ million expansion program, has created one of the outstanding screw machine departments in the East. *Sixteen new Cleveland Single Spindle Automatics* (14, Model AB 3" Dialmatics and 2, Cleveland 4¼" Model AW's) are among the facilities that are automatically setting the pace for progress at Whitin Machine Works.

William Steele, Divisional Superintendent, and Eino Johnson, Department Foreman, describe this ultra-modern installation as "one that few companies anywhere can equal. Our machine tool investment includes highly versatile Cleveland Automatics, many with electronic controls, that make possible higher production with still closer tolerances . . in many instances to 0.0005". As has been wisely said, 'you cannot build today's products with yesterday's machines, and still be in business tomorrow'."

Let Clevelands automatically set the pace for progress in your plant. Call in a Cleveland Automatic sales engineer.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

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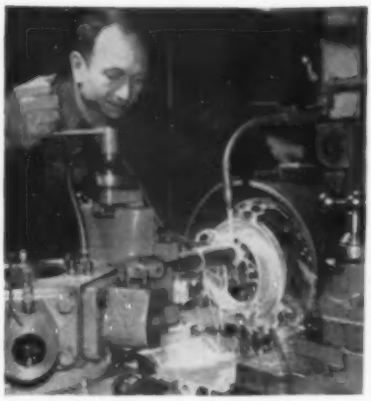
Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

letters from production men . . .



Coolant where you want it

In boring deep holes, threading, and using multiple hex turret tooling, the J & L automatic coolant distributor on our J & L turret lathes has been a life saver.

Custom-built coolant systems put the liquids where we want them when we want them. Coppersmiths and engineers are not required.

Keeping coolant off the chuck jaws and face plate fixtures which turn at 1,000 rpm and create a bad spray condition, has become very simple. Aluminum chips have been flushed all the way through the spindle. We have no more welding of aluminum to carbides when using four tools at once in different locations. On short runs with tight budgets, we "love that distributor."

— Machine shop owner —

How to have a soft job

I am a Purchasing Agent. The feature I like most on our battery of J & L Turrets is the effortless way they run, on and on, with an unmeasurable percentage of down time for maintenance or repair, plus never a customer complaint on the quality products produced by these machines.

My job would be a breeze if all machines ran like a J & L.

— Purchasing Agent —

Impressed by quality

The latest "machine usage" figures of our Research and Development Shops have just reached my desk for evaluation. I was impressed by the high usage and minimum maintenance "down time" of J & L machine tools compared with similar equipment of other manufacturers on a tool for tool basis. This in itself is proof to us of J & L's quality and the operator's choice of equipment.

Aside from the above proof of J & L's machine tool quality, the specific feature most appealing to us in the manufacture of many configurations of missile and radar radomes is the new two-way hydraulic tracing feature available on J & L's turret lathes, which profiles the exterior, interior and face on a work piece in one chucking. By simply pressing the selector switch, we disengage the tracing unit for standard turret lathe operation, an essential feature in our experimental fabrication department.

— Industrial Engineer —

Ten years without adjustment

You have now and have had for years, the outstanding Turret Lathe on the market. I have operated, set up and had charge of Turret Lathes for forty-five years and yours is the best in my estimation, for all around performance, ease of operation, accuracy and cost of up-keep. But the outstanding feature is your clutches. It's the only turret lathe that I know of, and I have operated them all, whose clutches really hold up. We have machines that have been working three shifts for ten years that never have had an adjustment on the clutch. If you put on an .025 feed that is what you get, not .015 or something else due to slippage. Why don't your salesmen stress this very important point?

— Shop Foreman —

Breath-taking possibilities

It is a long, nostalgic leap back to the turn of the century when the writer as an apprentice was first instructed in the operation of a Hartness Flat Turret Lathe.

My instructor, a kindly man, always claimed in his instructions to me that once I mastered turret tooling, setup, etc., I would be well on my way to a fair knowledge of the machinist trade.

True in part, at least, but I wonder how my old instructor would react now if we were to add my many years of directing machine shop activities, wherein all types of Jones and Lamson machines were used.

To me, as a recently retired production man, the line of Jones and Lamson Machine Tools is breathtaking in its possibilities.

— Production Mgr. —

Maintenance down — production up

Recently my firm purchased two Fay Lathes on a replacement program. The performance of these machines has been excellent. Due to the increased speed and feed, turning over 550 F.P.M., the standard time was decreased by over 60 per cent. Although this is an important factor in manufacturing, it's by no means the most important since down time would erase any gain in increased production. Due to the positive cam feed action, the ruggedness and the precision way these machines are built, we have had very, very little down time over the past 18 months. This is due to all the features designed and built into them which give them the ability to take it.

The ability to take rough punishment and still stand up on tough jobs means increased production due to very little down time with a minimum of maintenance.

— Process Engineer —

Novice makes good

Briefly and to the point, I like the #3 Ram type J & L turret lathe. It made me my living for the five years that I ran the machine; it was fast, accurate and easy to handle. And when I say accurate, I mean it. When I ran my J & L at the Navy Ordnance plant, we held turned dimensions to .0005" one way, and we held bores to ±.0005". It was fast enough to earn me a rate that was as high as other workers in the machine shop.

— Manufacturing Trainee —

The treasurer speaks

Being a small operator in our line of business, we are faced with constantly increasing costs of operation and declining man-power. It is therefore imperative that we operate as economically as possible and do everything within reason to conserve the strength and general welfare of our employees. Your 7B-4½ Saddle Type Lathe, with its range of speeds and automatic features, should be a tremendous help to anyone engaged in the metal-working industry.

— Treasurer —

Basic production reasoning

The problems of tooling for turret lathes vary in each plant. Each job requires its own standards of accuracy and each metal used has its own specific problems. However, the greatest factor is the variation in the quantities produced in each lot.

The aim of the quantity producer is to equip a standard machine with tools for one particular job. Tool cost of such methods is expensive. In small lot plants, such as ours (where five or more pieces constitute a lot), this method of tooling cannot be pursued. With our new J & L #5-4½ ram type turret lathe and tooling equipment, we apply the fundamental principles of turret lathe production. Using "combined cuts," "multiple cuts" and "rigid tooling" we have succeeded in increasing production with a small number of tools which will handle a large variety of work.

— Process Engineer —

(names of these customers available on request)

. . . to Jones & Lamson Machine Company

502 CLINTON ST., SPRINGFIELD, VT.

LOOK AGAIN AT COSTS

No bones about it, grinding problems *can* pile up! But there's a quick answer! Switch to CINCINNATI (PD)° WHEELS. For now Cincinnati Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that can *save you money . . . and increase your production.*

Through the Cincinnati (PD) manufacturing process, you are assured POSITIVE DUPLICATION of the original wheel every time you reorder. "On Grade" with a CINCINNATI (PD) WHEEL means all future (PD) wheels will perform and grind exactly alike.

Yet CINCINNATI (PD) WHEELS will cost you no more than ordinary wheels.

To banish those hovering problems, get in touch with your CINCINNATI GRINDING WHEELS Distributor. He'll be glad to explain how (PD) WHEELS will save you money and increase production. Or contact us direct and we'll send one of our representatives—specialists who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

Remember — only CINCINNATI (PD) GRINDING WHEELS give you

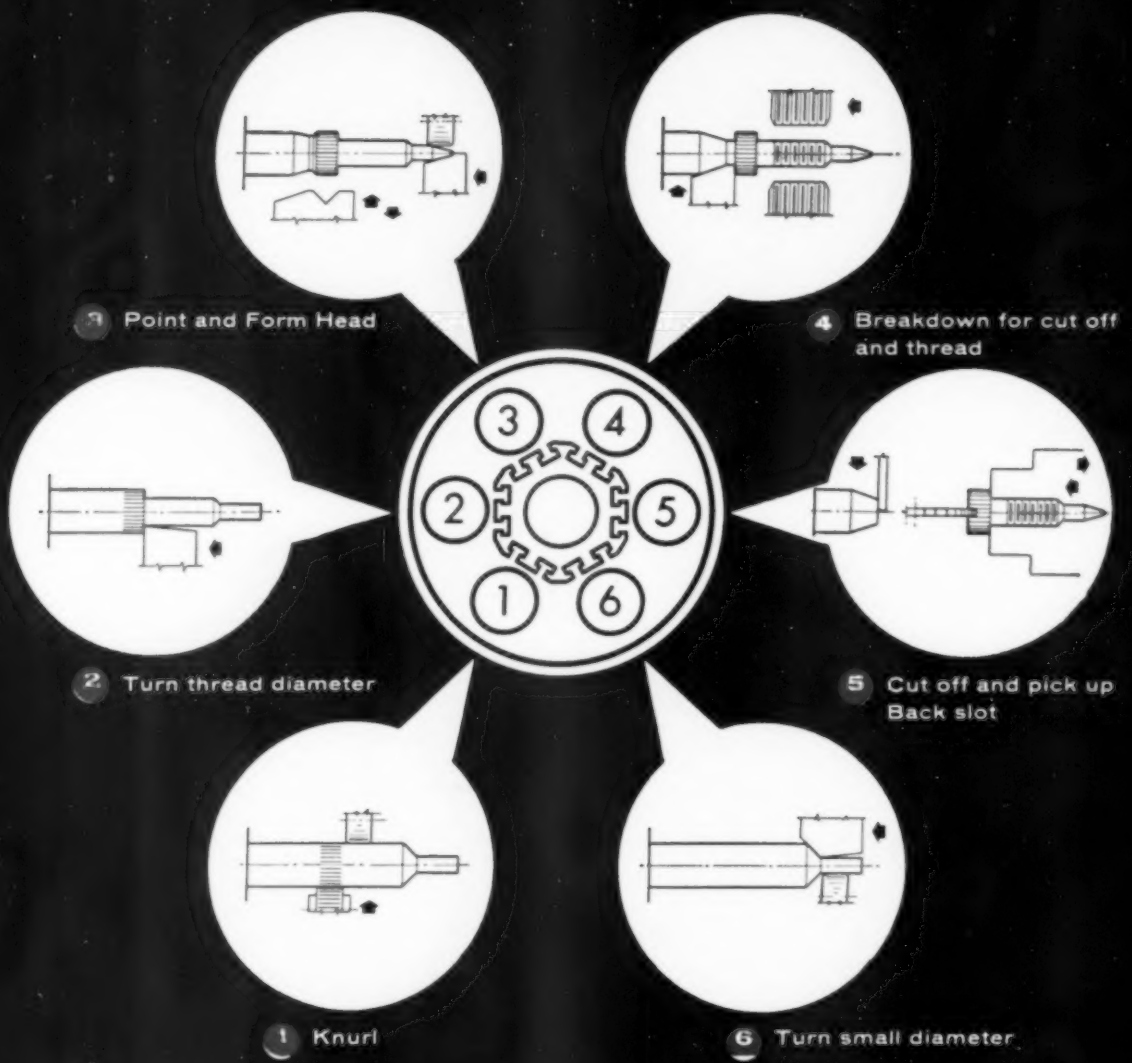
(PD) POSITIVE DUPLICATION

CINCINNATI° *Grinding Wheels*

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

° Trade Mark Reg. U.S. Pat. Off.

here's circumferential automation at work.....



In this example of circumferential automation, 9 operations are performed in 3 seconds to complete this carbureter idle adjustment screw. This part and thousands of others, many more complex, are produced to close tolerances, at high speeds and low costs on Acme-Gridley automatics.

circumferential automation*

pioneered by National Acme, saves floor space, reduces machine tool investment, lowers machining costs.

* Each spindle on an Acme-Gridley Automatic is an efficient work station where pre-sequenced operations are performed in succession without manual attention. This is automation . . . circumferential automation.

Circumferential Automation, inherent in all Acme-Gridleys since 1893, goes other forms of automation one step better. Instead of a line of machines, transfer devices and other space-consuming equipment, Acme-Gridley Multiple Spindle Automatics provide for maximum automatic production in a *single machine*. This means you save floor space, machine investment and man-hours.

Acme-Gridley Automatics with their "wide open" tooling zone provide maximum machining flexibility. Their extra heavy, extra sturdy "box" construction assures day-in, day-out production with minimum human attention.

Let us show you how Circumferential Automation can go to work for you—speed your production, improve production quality *and* lower your unit cost. Our representative will be glad to call without obligation

National Acme

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All 'round the world where there's work to be done
and time to be saved there's an Acme-Gridley to do it.

Save TIME and MONEY cutting KEYWAYS

In one minute and for as little as one cent you can cut a keyway with a Minute Man Keyway Broach Kit. For keyways from 1/16" to 1" in any bore from 1/4" to 3".

Save time with these other
STANDARD STOCK BROACHES

SQUARE BROACHES

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***New* ROUND BROACHES**

Used in an arbor or hydraulic press for finishing holes to exact size in *one pass.* 1/8" to 3/4" squares and hex's; 1/4" to 1" rounds. Production Type Keyway Broaches also in stock.

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MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name .....

Company .....

Address .....

Booth 139 — ASTE SHOW

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Auto quality

Dear Sirs:
Today just about every progressive industry has some degree of quality control to insure a reasonable degree of well-made merchandise. How different it is in the automobile industry. To illustrate:

With the 1958 car season is full swing now, many prospective car buyers are asking if the new cars will have any noticeable improvement in quality. They want to know if there will be any relief from the increasingly poor workmanship and sloppy assembly so common in many of the new and late models.

Despite all the fancy new car styling, the car makers' insane mania for more horsepower, and other useless gimmicks, many people are looking for some relief from the aggravation of repeated expense and loss of valuable time in having numerous factory-built defects repaired after the so-called new-car guarantee is up.

It's no secret to garage mechanics who prepare new cars for delivery to car buyers that there has been a sharp increase in shoddy workmanship and sloppy assembly methods in many auto assembly plants. Certainly it's no secret to the many people who bought new cars in good faith and then found that their cars were just carelessly slapped together by the notorious "quick-and-dirty" method so common in the auto industry. Strangely enough, we seldom see any mention of this growing cancer in the auto industry in newspapers, magazines, and trade journals. There must be a reason. No crystal ball is needed to see the many examples of poor and skimpy paint jobs, badly misaligned exterior body parts and shiny trim, and quick-rusting chrome plate on car bumpers. All these and the many recurring mechanical troubles indicate that the top managements of the car makers know in advance that many of their cars leave the assembly lines with built-in defects, both visible and hidden.

The most noticeable result of this growing cancer of the auto industry is the harsh fact that we have been getting less and less actual car value for more and more money each year as car

SHOPMATES

N. Jarvis

HEY!! WAIT A MINUTE!! I WAS JUST GONNA USE THEM ....
I THINK THEY'RE MINE BY RIGHTS — BUT I AIN'T SEEN 'EM FER SO LONG I COULDN'T BE SURE !!
THEY BELONGED TO ME ORIGINALLY .... BUT MY MARK GOT WORN OFF — YOU GUYS PASSIN' 'EM AROUND LIKE A HOT HAND GRENADE !!
SURE YOU WAS!! AND MOST OF MY OTHER TOOLS TOO — WHY'NT YOU BUY YER OWN YA CROOK!!
N. JARVIS

SHOW THIS TO YOUR TOOLMAKER

Ask him if he doesn't agree that the Leland-Gifford No. 2LMS Toolroom Drill Press provides every feature and convenience needed in the modern toolroom for fast, accurate, effortless drilling and tapping. Developed in cooperation with leading tool engineers, this machine has won wide acceptance as the ideal drill press for general purpose toolroom use. Write for complete information.

LELAND-GIFFORD
No. 2LMS
TOOLROOM DRILL PRESS
with all these features:

1 Illuminated indicating shift with cutting speed chart.
2 Conveniently located hand wheel for changing spindle speeds without stopping machine . . . also for shifting back gears when furnished.
3 Positive stop for accurate depth adjustment.
4 Capacity of No. 2 Morse taper. No. 3 MT optional.
5 Extra large 37″ x 25″ or standard 26″ x 25″ work table.
6 26″ swing with 13″ overhang.
7 Handy push-back table raising crank and quick-acting table lock.
8 Foot switch start-stop motor control leaves operator's hand free.
9 Counterbalanced sliding head for effortless vertical adjustment.
10 Built-in light for table and work surface illumination.
11 Sensitive hand lever feed with ratchet adjustment, or . . .
12 Reversing motor control for tapping — provides manual control from feed lever or automatic control by depth stop (optional at small extra charge).

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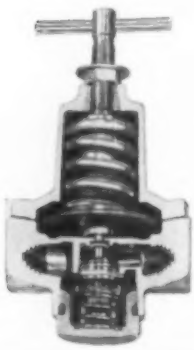
2620 Leonis Blvd.
Vernon 58, Cal.
INDIANAPOLIS 6, P. O. Box 1051
ROCHESTER 12, P. O. Box 24, Charlotte Station

FACTS about *Norgren* PRESSURE REGULATORS

Norgren Pressure Regulator on punch press at Shwayder Brothers, Inc., maker of Samsonite Luggage.

Reduce Air Costs... Cut Maintenance Costs

For any air operated equipment, there is one pressure at which it is designed to operate most efficiently. Above that pressure, equipment will wear excessively with no significant increase in output, and compressed air will be wasted. No matter what the application, you can choose a Norgren Pressure Regulator that will reduce line pressure to the desired working pressure. Results will include longer equipment life, lower maintenance costs, less down-time and savings in compressed air costs.



- **Norgren Pressure Regulators are Highly Accurate** over a wide operating range.
- **Regulated Pressure is Held Constant** even with widely fluctuating line pressure and rapidly varying air flow.
- **Flow Capacity is Large**—a. Balanced valve construction; b. Large effective diaphragm area; c. Improved baffle and siphon performance; d. Large passages; e. Large valve openings.
- **Choice of Relieving or Non-Relieving Regulators.**

For complete information on all your regulator needs ¼" to 2" inclusive, call your nearby Norgren Representative listed in your telephone directory—or WRITE FOR NEW No. 900 CATALOG.

C. A. NORGREN CO.

3436 SOUTH ELATI STREET ENGLEWOOD, COLORADO

prices go up and up without a corresponding increase in car quality. That is why so many people are going to think twice about the 1958 cars until they feel that they will get somewhere near their money's worth in more car quality and noticeably better workmanship. People are getting tired of being guinea pigs for the car makers at their own expense.

R Blagden
East Hampton, Conn

Schools

Dear Sirs:
Re: Your editorial, "What you can do for your Schools" (*AM*—Jan 13 '58, p95).

Congratulations and Amen.

A C Taylor, *Principal,*
St Paul Vocational School
St Paul, Minn

Tennessee tooling

Dear Sirs:
I have just read, with a great deal of interest, the article, "Tennessee Bids for Metalworking" (*AM*—Dec. 30 '58 p114).

Tennessee has the largest and finest concentration of tool and die plants in the Southeast, with Nashville being the center of this group. Since Tennessee is bidding a great deal for the metalworking industry, this has been a prime factor for many of the metalworking plants in their selection of Tennessee as a site for their expansion.

Fred D Wright
Nashville, Tenn

Helpful Henry

by L. Hoppes

"I brought your check, Herb, woops!"

CALENDAR

American Society of Mechanical Engineers and American Rocket Society—Joint Aviation Conference, Mar 17-20, Hotel Statler-Hilton, Dallas, Texas.

American Society for Metals (Golden Gate Chapter)—Annual Western Welding, Brazing, and Heat-Treating Conference, Mar 27-28, Stanford Research Institute, Menlo Park, Calif.

Society of Automotive Engineers—Production Meeting and Forum, Mar 31-Apr 2, The Drake, Chicago, Ill.

Society of Automotive Engineers—Aeronautic Meeting and Display, Apr 8-11, Hotel Commodore, New York, NY.

American Welding Society—Annual Meeting and Welding Show, Apr 14-18, Kiel Auditorium and Hotel Statler, St Louis, Mo.

AIEE, ASME, IRE—Joint Conference on Automatic Techniques, Apr 14-16, Hotel Statler, Detroit, Mich.

Metal Powder Association—Annual Meeting and Powder Metallurgy Show, Apr 21-23, Sheraton Hotel, Philadelphia, Penna.

American Society of Tool Engineers—Tool Show and Annual Meeting, May 1-8 (closed Sunday), Convention Center, Philadelphia, Penna.

National Tool & Die Manufacturers Association — Spring Meeting, May 3-6, Statler Hotel, Washington, DC.

American Society for Metals—Southwestern Metal Exposition and Congress, May 12-16, State Fair Park, Dallas, Texas.

American Supply & Machinery Manufacturers Association — Triple Industrial Supply Convention and Exhibition, May 26-28, Madison Square Garden, New York, NY.

National Materials Handling Exposition and concurrent ASME conference on Materials Handling, June 9-12, Public Auditorium, Cleveland, Ohio.

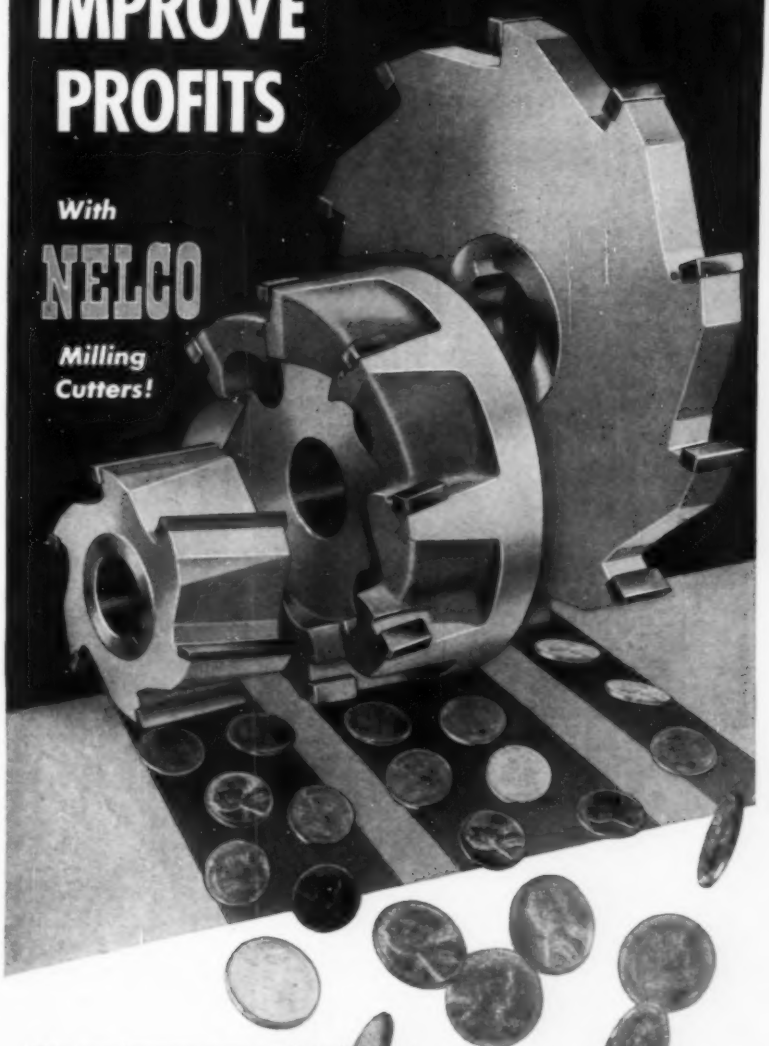
Brown & Sharpe – NELCO *A Tremendous Tooling Team!*

IMPROVE PROFITS

With

NELCO

Milling Cutters!



You CAN improve your profits when you specify milling cutters! It costs money to remove chips . . . and *efficient* metal removal can add pennies to your profits—every hour of every production day!

REMEMBER. Your investment in a machine tool, a skilled machinist—yes, in the very plant itself—pays off only in the efficiency of the production tools you use!

Specify NELCO Engineered Carbide Tipped tools. Remove more metal, more quickly, more efficiently, count the savings . . . *improve your profits* NOW!

Join those who specify only the best in carbide tipped tooling. Send today for the new Nelco Catalog, showing over 700 cost-cutting tools.

NELCO TOOLS

For that EXTRA *Edge in Production!*

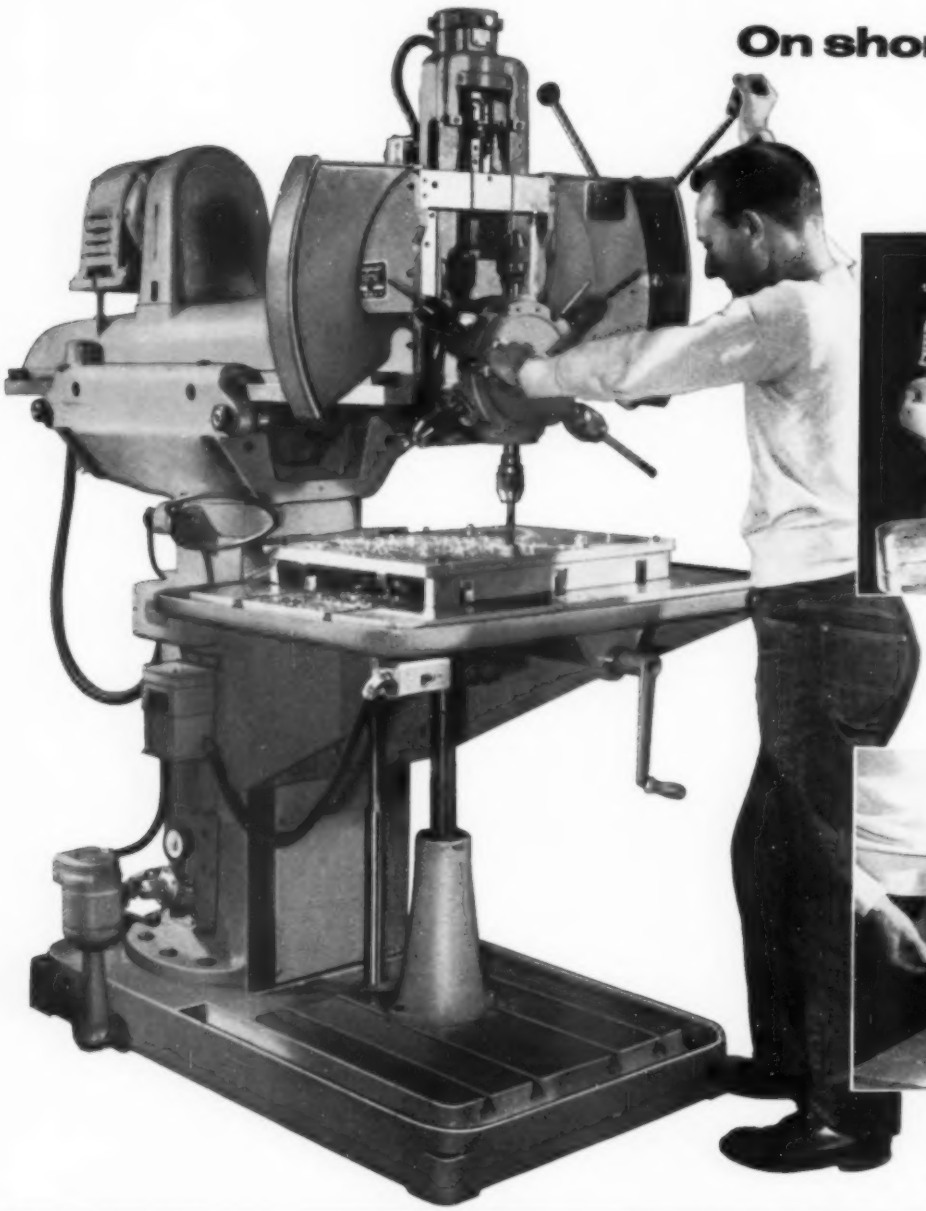
Nelco Tool Co., Inc. • Manchester, Conn.

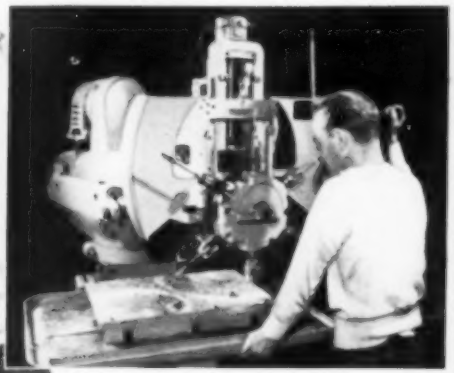
Increased 100%

Production

with Burgmaster 6-Spindle

On short run job.





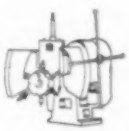
Close-up showing details of how the job is set-up and run. Operator works out the sequence of operation best suited to the job.

Main plate 19" x 14" x .375" showing the 79 different operations performed from front and back sides, utilizing twenty different tools.

Specialists in High Production Turret Drilling

1C Manual Power Index 3/16" Capacity

2B Manual Power Index 3/4" Capacity



2BF Flange Mounted Power Index 3/4" Capacity

2BH Automatic Hydraulic 3/4" Capacity

3BH Automatic Hydraulic 1½" Capacity

2BR Ram Type Radial Drill 3/4" Capacity

2PT-3PT Automatic Tape Controlled 3/4" and 1½" Capacity

Increased 100%

Radial Turret Drill (¾" capacity)

Technical Products Company, Hollywood, California, increased production 100% on main plates for moving picture film reproducers with a Burgmaster 6-spindle radial drill. This job involves 79 operations on front and back sides, utilizing twenty different tools. The job is further complicated by the fact that many of the drilled C' bored, and tapped holes are held to accurate depths. Formerly this job was done on 4 and 6-spindle table drills and took approximately five hours per plate—it's now done in 2½ hours.

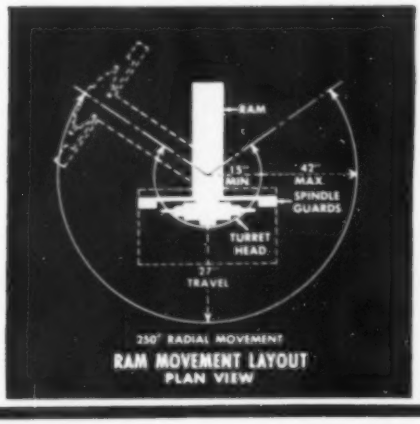
The simplicity and ease with which the Burgmaster radial drill can be moved from one location to another, together with the 6-spindle automatic indexing turret which carries out a sequence of operations rapidly, accounts for the savings. Accuracy is assured by air hydraulic clamping of the ram slide and cradle, automatic turret clamping, and the rigid micrometer depth control. A wide range of preselective spindle speeds provides fine finish, high production, and long tool life.

It will pay you to look into the matter of turret drilling on your work. There is a Burg direct representative or dealer near you who will be glad to assist—without obligation.

The Brief Job Facts

Machine—*Burgmaster 6-Spindle Radial Drill*
Part—*Main Plate 19" x 14" x .375"*
Material—*Aluminum*
Lot Size—*1 to 30*
No. of Types—*4*
Accuracy—*±.001, and ±.005*
Fixture—*Special Fixture with Drill Bushings*
Former Method—*4 and 6 spindle Table Drills*
Former Time—*5 hours*
Present Time—*2½ hours*
Production Increased—*100%*

Number of Operations	Operations	Number of Operations	Operations
8	¼" Drill through	3	#10-32 Tap, ¼" deep min., back side—Do not break through
1	5/16" Drill through	1	#10-32 Tap Through
3	.500 +.002 −.000 Dia.	4	#4-40 Tap ¼" deep, Back Side—Do not break through
1	11/16" Dia., 1⅛" dia. C' Bore 5/16" deep. Back Side.	25	#8-32 Tap ¼" deep, Back Side—Do not break through
2	⅛" Drill through 82°C Sink 1/32" deep. Both Sides.	12	#8-32 Tap Through
1	1.250 +.002 −.000 dia.	1	5/16"—18 Tap through
1	¾" dia.	1	.2505 .2515 Ream
3	1.515 dia.	10	#4-40 Tap through
3	1.87 1.88 Ream, ¼ deep back side; do not break through	4	#2-56 Tap, 3/16" deep
4	.272 Drill, .390 dia. C' Bore, ⅛" deep.	1	1.000 +.002 −.000 dia.
		Total 79	20 Different Tools



RAM MOVEMENT LAYOUT
PLAN VIEW

The radial drill sweeps a radius of 14" minimum to 42" maximum through 250° over a 24" deep x 36" long table. The ram rolls on large double row ball bearings and is easily controlled by one hand from the handle on the turret. A press of the thumb releases the air hydraulic clamping of the ram and cradle, permitting free and easy movement of the ram in any direction. Releasing the button clamps all units rigidly in place, after which the spindle can be advanced to perform a precision operation.

Write for bulletin describing Burgmaster 6-Spindle Radial Drills in detail; also 20-minute 16MM sound film showing Burgmaster Turret Drills in operation, including the new Automatic Tape Controlled Machine, available from any office.

BURG TOOL
MANUFACTURING COMPANY, INC.
15001 South Figueroa Street, Gardena, California
FAculty 1-3510 DAvis 9-4158

BURGMASTER DIRECT SALES OFFICES:

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Plus dealer representatives in other industrial centers.

Turn your pressing problem into a *profit operation* with an

C-FRAME STRAIGHTENING PRESS

Accessible, fast, flexible for performing a variety of general-purpose straightening, forcing, bending and forming work. Sizes and capacities for all service needs.

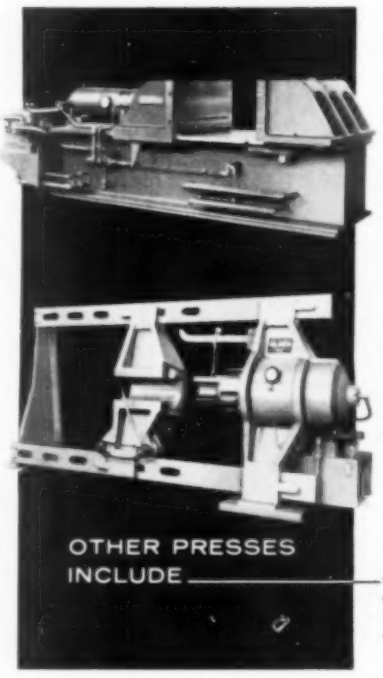
ELMES

"Job-Fitted" HYDRAULIC PRESS

Hundreds of manufacturers have called on Elmes to help solve production problems involving pressure application. It's no secret that Elmes engineering is pre-eminently qualified to provide this profit-making service—to recommend *the right press for the job.*

It will pay *you*, too, to call in Elmes on your pressing problems. Maybe your answer is in one of the many standard Elmes® designs, either "as is" or with simple modification. Or, if your requirements are special, Elmes will develop a "custom-built" press to fit your needs *exactly*. This special-design function has long been an important part of Elmes' service to industry.

In any case, you'll be wise to take advantage of engineering knowledge, skill, and foresight backed by more than 60 years of leadership in specialized hydraulic service. Recommendations and cost estimates promptly supplied. See your Elmes Distributor, or write us direct.



HORIZONTAL BULLDOZER

For heavy bending and forming. Wide range of capacities with optional choice of bed size, stroke and speed to suit individual needs.

INCLINED FORCING PRESS

For forcing heavy wheels, gears, and pulleys on and off shafts, for maintenance work, etc. Capacities from 100 to 1000 tons.

OTHER PRESSES INCLUDE—standard and special designs for drawing and forming, coining, forging, hobbing, powder metal compacting, etc.

Elmes American Steel Foundries
ENGINEERING DIVISION

1161 Tennessee Avenue, Cincinnati 29, Ohio

METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

SPOT NEWS...

- **"Building block" computer system** has been developed by Aeronca Mfg Co, Baltimore. Units are modularized so that they can be strung together to do arabic to digital conversion, conversion of any binary code to any other binary code, digital comparison of voltage tolerance, and digital to arabic conversion. System can be assembled from off-the-shelf components.
- **Melting and casting of such special metals as titanium and niobium** (columbium) is being done in a process developed jointly by Stauffer Chemical, Mallory-Sharon and Temescal Metallurgical Corp. Process employs electron bombardment in a high vacuum to melt high-temp metals, is expected to lower cost and increase output of commercial quantities of high-purity metals, and to allow recycling of scrap.
- **West German screw machine products team will be in the U S April 26** to study U S methods and meet with builders of screw machines.
- **Some 200 related pieces of information on a spare part** go onto a single piece of magnetic tape in a new electronic data processing machine developed by the aircraft industry and the government. System will allow instantaneous exchange of spare parts data between electronic machines of contractors and military bases through a direct telephone hookup.
- **Synthetic diamond wheels are being marketed quietly by several producers** of diamond wheels. No attempt is made to reveal the fact that the wheels are made with synthetic rather than natural diamonds. In fact, the new wheels are offered at a price about 30% higher, with the promise that they will give at least that much more production.
- **Rumors that the Edsel was tooled overseas** and that tooling work is still being imported caused Ford UAW Local 600 officials to send Ford a letter saying "Your continued silence . . . has added credence to these rumors. And so does the fact that many body prints have showed up with metric dimensions." Replied a Ford spokesman, "A small trial order for 1959 Ford car tooling had been placed in Europe, but there are no plans at present to repeat."
- **Nationwide automation data service for numerically-controlled machine tools** will furnish completely processed magnetic tapes to aircraft manufacturers for machining of parts (details on p87).
- **Tungsten-carbide extruding dies for extruding an Mg-Si-Al alloy at 932 F** are being used by a British firm which has worked 1540 billets through a die with 0.387-in.-dia single bore without a sign of tool wear. Normal life of a steel die with same billet material was 120 billets.
- **Look for UAW to come out against the practice of "moonlighting"** (a second, after-hours job). UAW wants an anti-moonlighting clause written into each new contract, specifying that a worker either quit his after-hours job or be fired automatically from his regular job. UAW's definition of a moonlighter—a man who is working for his wife's next husband.
- **Aluminum die-casting alloy that withstands loads to 1500 psi** has been developed by Alcoa for heavy bearing applications. Alloy's tin, lead and cadmium combine, Alcoa says, to provide good casting and machining characteristics, a typical tensile strength of 36,000 psi, and casting strength of 20,000 psi.

Spot index to major News stories...

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XLO EX-CELL-O FOR PRECISION

CHIP-BREAKER ASSEMBLY: On the opposite end, mounted under the reciprocating chip-breaker wheel is the chip-breaker table with vertical adjustments. It accommodates adjustable tool block fixture which holds tool in place while grinding chip-breaker groove at desired angle.

TWO MODELS AVAILABLE: Style 142 for conventional grinding with vitrified or diamond wheels; Style 264, equipped with metal-bonded diamond wheels, for *electrolytic* grinding.

new DUAL PURPOSE RECIPROCATING TOOL GRINDER

Ex-Cell-O takes all the work out of both conventional and chip-breaker tool grinding

Now an entirely new reciprocating double end tool grinder designed by Ex-Cell-O to do two jobs in one—conventional grinding on one end, chip-breaker grinding on the other—has now been added to Ex-Cell-O's line of conventional, double end, carbide and Method X tool grinders. The difference is the adjustable, power-controlled reciprocation of grinding wheels. The operator need only hold the tool at the pre-set angle.

Other features of this new grinder include: variable stroke (0 to 1½"); variable number of reciprocations (0 to 220 strokes per min.); in-built motorized precision grinding spindle, saddle-mounted to reciprocate along hardened and ground bars which are mounted on pre-loaded ball bushings. You'll want to see for yourself the capabilities of this new Ex-Cell-O—to do so, simply contact your local Ex-Cell-O Representative. Or, if you wish, write direct to Ex-Cell-O, Detroit. Ask for Bulletin 461872.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-25

WASHINGTON...

New defense budget hikes...

The military services have put together preliminary budget estimates for fiscal 1960 totalling $49.6 billion. This is almost $10 billion more than the fiscal 1959 military appropriation now being considered by Congress.

The so-called "Unilateral Service Plans" for the fiscal year beginning July 1, 1959, have been turned into Defense Secretary McElroy's office, and are the first official sign of plans to boost defense expenditures along the vast lines proposed by the Gaither and Rockefeller Committees.

The fact that the three Services want a total of $49.6 billion in new funds for fiscal 1960, however, does not mean that the administration defense budget that goes to Congress next January will necessarily add up to this amount.

Over the next nine months, these initial budget estimates will be modified, revised, debated, and thoroughly screened by the Defense Comptroller, the Budget Bureau, and the White House. What comes out as the administration's final military budget will not be the same as the early "Unilateral Service Plans."

But in light of the post-Sputnik changes in Washington thinking, it's obvious that the administration will buy more of the Service's budget proposals than they did last year. The fiscal 1959 budget, totalling $39.7 billion in requests for new funds, represents a slash of $9.3 billion from the three Services' initial requirements. A reduction of such magnitude is no longer likely.

Extra budget request...

Already, there's talk in the Pentagon of a supplemental defense appropriation request for fiscal 1959 to be submitted to Congress before the full appropriation is even voted upon. This would add some $2 billion in new fund requests to the $39.7-billion appropriation now being considered.

The extra sum would include money for additional production of B-52 bombers, jet tankers, advanced Army small arms, the subsonic Snark strategic missile, and similar weapons severely restricted under the current budget.

There is considerable Washington sentiment—notably in the Air Force—for continuing production of so-called "interim" weapons like the B-52 and Snark for use during the years until the ballistic missiles become fully operational.

Breakdown on budget hikes...

This view is also strongly reflected in the $49.6-billion "Unilateral Service Plans" for fiscal 1960. These preliminary budget proposals call for $10.7 billion in new funds for procurement of manned aircraft.

The current budget calls for only $6.9 billion, the lowest aircraft production sum in the budget since Korea. The increase is proposed not only for B-52's and jet bombers but for tactical, fighter interceptor, and transport planes—types of aircraft severely slowed down under present defense production schedules.

Other items in the proposed fiscal 1960 budget: $3.9 billion for missile production, only $300 million over the fiscal 1959 budget; $1.9 billion for shipbuilding, mostly for missile-armed nuclear submarines—up $600 million; $2.6 billion for research and development, an increase of $600 million over the latest appropriation request.

Tariff fight...

. . . is being fought by the manufacturers of electrical machinery. They appeared before the ways and means Committee of the House of Representatives to ward off imports of electrical power generation and transmission equipment.

A F Metz, chairman of the National Electrical Manufacturers' Import Committee, singled out the following equipment coming in that is to an extent injurious to domestic producers: hydraulic, steam, and gas turbines; governors and generators, large transformers, switchgear, instrument transformers, motors of more than 500 horsepower.

Outer space...

. . . experiments seem likely to wind up under a civilian agency. Army, Navy, and Air Force officials are fighting over the issue. But the Air Force and the Navy say they'd be happy to have the National Advisory Committee for Aeronautics handle the job.

It's one of the most highly-regarded basic research outfits in the business; headed by retired Air Force General James H Doolittle, who is now a Shell Oil vice-president.

Eisenhower's science advisor, Dr James R Killian, knows how the services feel about it. Eventually, it will be up to him to make recommendations to the President.

time saved is . . .

money

BULLARD

The application of Bullard Mau-Au-Trol Vertical Turret Lathes, Model 75, to the machining of aircraft turbine compressor cases clearly demonstrates the superiority of automatic operation.

According to Mr. George E. Saupe, Chief Manufacturing Engineer at Solar Aircraft Co., San Diego, California, these are some of the advantages:

1 Spoilage practically eliminated.

2 Machining time reduced from 14 hours to 1 hour and 42 minutes per unit.

3 In process inspection unnecessary.

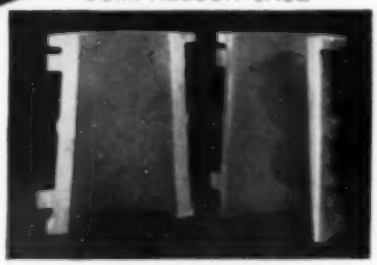
4 Better production control.

5 Reduces error of the operator.

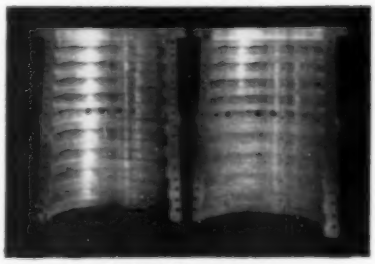
6 Less work in process inventory.

A call, to your nearest Bullard Sales Office or Distributor, can be your first step toward time saved and money earned with your machining problems.

SOLAR JUPITER COMPRESSOR CASE



ROUGH PIECE



FINISHED PIECE

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

TRENDS

DETROIT...

Auto production hits 1958 low...

The week ending February 22 saw car output sink to a level as low as that usually experienced only during Christmas and New Year's. The miserable total was 90,094 cars and 17,674 trucks and buses.

Chrysler Corp still leads the drop, having produced only 90,989 cars so far—compared to 225,347 for the same period last year.

Worst hit Ford product is Mercury, off from last year's pace by nearly two-thirds. Studebaker-Packard is now down an even half. GM figures are 444,588 vs 519,589, a loss of a little over one week's production in all lines. American Motors, on the other hand, is maintaining a pace better than double that of last year.

Cadillac press plant facelift ...

Newsmen last week got their first look at one of the biggest plant renovating jobs in Detroit history. Back in April 1956, Cadillac, leased and later purchased for about $1 million the abandoned Hudson body plant. Typical of its condition was that over 15,000 window panes had to be replaced. Complete details on new plant were in *AM*—Dec 2 '57, p113-120.

Previously, all stamping operations except for body parts, were at the overcrowded main Cadillac plant on Clark Street. Space was so cramped that many operations were on a costly around-the-clock basis to keep up with the 2-shift, 5-day assembly line.

Some 350 machines, weighing 70,000 tons, were moved to the new location, and 60 more were purchased. Total cost of the move and renovation exceeded $12 million. Now on regular hours, the Stamping Division stays two days ahead, using 11,000 tons of steel every three weeks. This steel, however, does not include that for body shells, which are furnished complete by Fisher's Fleetwood Division.

New diesel tractor...

Ford Tractor and Implement Division last week announced plans to market a diesel-powered farm and light construction tractor with an engine of its own manufacture.

The new engine is literally a conversion of the existing 172-cu-in., 4-cyl "Red Tiger" gasoline-burning power-plant. All reciprocating parts were beefed-up to stand diesel stresses and the OHV cylinder head was redesigned to accept a Roosa Master and Simms injection system.

The company will continue to import the heavier Fordson major diesel tractor from England, but the news of an American Ford diesel touched off speculation that Ford was embarked on a conversion program for its line of truck and stationary engines. There once was basis to this rumor, but the engineering problems apparently were insurmountable, so the development program was called off.

Even though Ford is heavily involved in producing trucks of over 26,000 lbs GVW—a category that is 30% diesel powered—forward planning manager R A Latimer recently said "Ford is not developing a diesel truck engine."

South of the border...

Chrysler and Willys will join forces in Brazil to manufacture a car based on the 1956 American Plymouth. It will be sold only in South America, and the cooperation of the two companies in that area should not in any way be construed to mean that the two parent corporations in the United States are thinking of merger.

Published reports have stated that American rights to manufacture the Willys Aero were included in the transaction. The facts are that Chrysler export people took a long look at the Willys Aero, a 108-in.-wheelbase, unit-construction car manufactured from 1953 to 1955 in the United States. However, the interest was in possible manufacture overseas, not in this country, and even this idea has been abandoned. The car is considered too obsolete to bring back on the market.

Mink coats sell cars...

With dealer stocks nudging record highs, frantic factory promotion men are hauling out incentive plans normally reserved for all clean-up efforts.

The twist is as old as Adam and Eve. The wives of dealers are offered mink capes and expense-paid vacations to Hawaii if their husbands will get out and sell a few extra cars. He probably will try if only to escape a nagging female.

On the serious side, most auto men attribute slow sales to an "unwarranted" lack of public confidence in the economy. Pointing to the $20 billion in personal saving accounts, Buick General Manager Edward T Ragsdale says: "If we as a nation are headed for the poorhouse, we certainly are going well-heeled."

Ragsdale is one of the Detroit executives who blame the daily and business press for helping to create this lack of confidence. He charges that only bad news gets headlines nowadays, and that good news is stuffed away on the back page.

GREENLEE TRANSFER MACHINES

Change with Your Requirements

THIS MACHINE HAS BEEN REWORKED FOUR TIMES

The "building block" idea of machine tool design has gained much popularity in recent years. Greenlee has long built such flexibility into their transfer machines. For example, the machine shown here has been modified 4 times in 11 years to accommodate changes in product design. Protect yourself from costly obsolescence. Ask Greenlee to show you how.

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AIRCRAFT and MISSILES...

TRENDS

Numerical controls gain ground...

Enthusiasm for numerically controlled continuous-contouring machine tools is growing among production people, particularly in those aircraft plants that have had Air Materiel Command-furnished systems long enough to know them.

Consensus among aircraft people is that the numerically controlled systems are equalling or bettering expectations in upgraded tolerances, lowered costs and reduced lead-time.

Northrop Aircraft, which has three such machines in operation out on the West Coast, estimates that they have cut production costs 50 to 75%.

But experience has also turned up the need for some precautions in the use of such numerically controlled machine tools as big skin millers and profilers, and in point-to-point systems (for jig borers, drill presses, etc) that will be more immediately usable in small shops.

For one thing, a numerically controlled machine tool must be integrated into a carefully thought-out system that begins with an engineering drawing and ends with a finished part.

As one aircraft production man puts it, "It's like planning a refinery, but on a smaller scale. You have to know what you're doing from start to finish and select your equipment to fit a total pattern."

Evidently both the builders and users of numerically controlled machine tools have a few bugs to iron out before such machines can achieve their full potential. Some aircraft companies have complained, for instance, that some builders have paid too little attention to selection of such auxiliary equipment as automatic oilers and pressure accumulators. These cause more downtime, they say, than the machine tools themselves and their control equipment do.

But such deficiencies are comparatively minor, are already being ironed out. Aircraft companies on the whole are more than satisfied with the performance of numerically controlled machines.

Best example of this comes from Lockheed, which has been working for several months with two machines furnished by the Air Materiel Command.

Lockheed just recently laid $500,000 of its own money on the line for a numerically controlled skin miller.

And while the big continuous-contouring systems now used in the Air Materiel Command program are designed for the large primes, experience gained in their operation will be invaluable in the development of smaller systems that can be used one day soon by smaller firms.

Stromberg-Carlson has come up with plans to supply operating tapes for numerically controlled machine tools to aircraft and defense manufacturers all over the country.

The tapes will be completely processed, i.e, punched with operating data so that the recipient merely has to insert the tape in his numerically controlled machine tool and the machine turns out the part.

"It's as simple as sending color film to the laboratory for processing," Stromberg president Robert C Tait says, "and . . . should accelerate greatly the introduction of these new automation techniques into industry generally."

Stromberg-Carlson, under Air Force contract, will use three high-speed computers to process magnetic tapes for numerically controlled machine tools to be furnished to aircraft manufacturers by the Air Force. Convair, for example, has been assigned several such machines.

System works this way: aircraft tooling people will furnish the data, taking it from their blueprints. Data is punched into permanent storage on paper tape through a keyboard unit.

Punched tapes then go to the nearest processing center for conversion into magnetic control tapes. From there, tapes are delivered quickly to the user.

In other words, an aircraft manufacturer's engineers get the data together, send it in to the computer center for processing, and back comes the tape to the manufacturer's production department—all ready to go into the machine tool.

Ultimately, the process will probably be used by primes to feed N/C data to their top subs, too.

First processing center is in Los Angeles, where three units are going into operation very shortly, and a fourth is on order. The center is particularly being geared to provide fast tape service for the low-priced N/C units offered by Kearney & Trecker and Morey Machinery.

Aircraft industry financing . . .

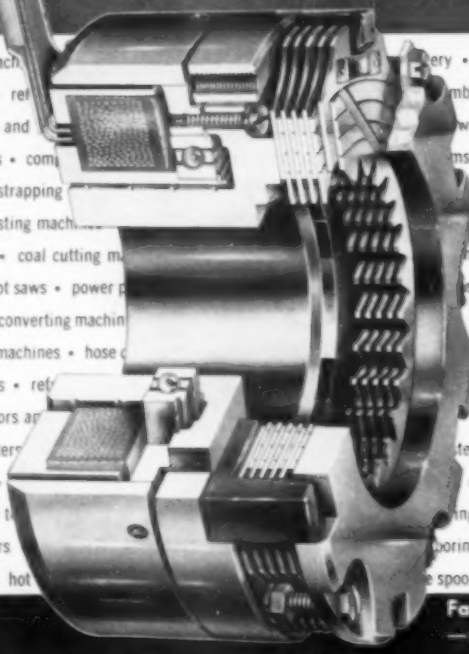
Some financial operating facts about the U S aircraft industry came to light in a recent speech by General Orval R Cook, president of AIA.

Said General Cook: the aircraft industry has reinvested some 60% of its earnings—the highest of any U S manufacturing industry.

And it has risked more than $100 million for industrial facilities to produce ballistic missiles.

Since World War II, aircraft producers have invested more than $1 billion in research and test facilities, plan to invest another $1 billion in the next five years.

FAWICK MAGNETIC



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FAWICK Magnetic Clutches and Brakes are particularly suited to machines developed through advanced thinking and creative engineering. They have a very favorable torque capacity vs. size ratio. Their performance permits instantaneous starting, rapid acceleration with heavy loads, high cyclic rates. Design provides for oil or dry operation and excellent heat dissipation. Construction is rugged, making wear negligible and minimizing maintenance. Available sizes range from 2" to 13" in diameter, 36 in.-lbs. to 48,000 in.-lbs. torque capacity.

For more information, get your copy of Bulletin M-101 from your nearest FAWICK representative or the home office.

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INDUSTRIAL CLUTCHES AND BRAKES

MACHINE TOOLS...

Leasing and time-payments grow . . .

Leasing of machine tools, which has made up a rather small but solid portion of total sales, is about to be pushed hard again. Certain people believe the time is ripe to campaign aggressively for leasing, especially with business hard to get and customers reluctant to invest their own money in capital equipment. Ample funds will be available to finance the leasing.

Time-payment purchases of machine tools now comprise a considerably larger share of total sales than they used to, a current checkup shows. The comparison with 10 years ago reveals a striking gain percentagewise. This growth should not be surprising, as many builders now have arrangements with commercial finance companies for customers to acquire new machines on a "pay-as-you-depreciate" plan.

Machine tool imports rise sharply . . .

Around $37 million of machine tools were imported into the United States during 1957, government figures reveal. In view of the fact that Washington's method of classifying and counting machine tools is believed to be faulty, chances are that actual imports were higher than the stated figure.

Dollar volume last year showed a big gain over imports of about $24 million in 1956 and $16 million in 1955.

Germany got the largest share of dollar volume of imports, with Britain second, Switzerland third, and Italy fourth.

Engine lathes and radial drills are the leading items imported from western Europe.

European carmakers expanding . . .

European auto makers, taking advantage of the world-wide demand for small cars, still are expanding their facilities and reducing their production costs.

Opel has a sizable machine tool buying program, some of which has been placed in this country. The bulk of the business, however, is believed to have gone to German builders.

Volkswagen is on the verge of purchasing, or already has purchased, a considerable number of machine tools for its Wolfsburg factory. U S builders are expected to benefit from a portion of this program.

Renault is in the midst of a large tooling program for which machine tool orders are being placed. Most of the business probably will go to European builders.

Foreign orders constitute a large share of the machines now in production at plants of several U S builders.

Surplus problem growing . . .

Air Force is reported trying to sell about 3500 surplus machine tools a year. It has 9000 or more, stored at its depots, ready for sale.

Air Force is believed to have shipped as many as 1000 of its surplus machines overseas (to India and Spain, for example). This action causes trouble because the demand abroad is not good, the machines are expensive to prepare and ship, European and U S builders complain.

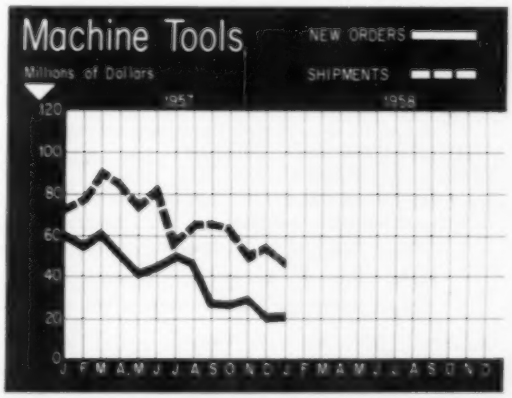
Storage of idle machine tools is too expensive, Air Force feels. Moreover, Congress will not stand for it. Armed services seem to agree on one point: storage of machines under power is prohibitive in cost.

Inter-agency task force recreated . . .

Government's inter-agency task force for machine tools is being recreated to set "appropriate and workable guidelines to be followed" in considering whether surplus machines should be placed in the National Industrial Equipment Reserve for use in post-attack reconstruction and rehabilitation of civilian defense facilities.

Up to now the National Industrial Equipment Reserve has been limited to requirements for direct defense production. ODM again will take over as head of the inter-agency task force.

BF



January new orders for machine tools rose slightly after hitting a low point in December. New orders on the National Machine Tool Builders' Association Index climbed from December's $18.6 million to $19.35 million in January. Shipments, meanwhile, dropped from $55.45 million in December to $45.85 million in January.

ND FACTS

Position means nothing in the life of a ball bearing!

Upside down . . . right side up . . . sideways! Electric motors made with New Departure ball bearings keep their performance promises in *any* position.

Such versatility is welcomed by appliance makers . . . machine tool builders, too . . . because it means infinite freedom of design. Accessibility for service need not be the ruling factor in motor location. For motors made with New Departure ball bearings . . . like the bearings themselves . . . are built to be forgotten for long periods of service without need for relubrication. Best of all, you'll find there's no adjustment necessary because of wear.

If you're looking for ways to simplify product design while you improve product performance, write or call for details on New Departure ball bearings. New Departure Div., General Motors Corp., Bristol, Conn.

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GM
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DIVISION OF GENERAL MOTORS, BRISTOL, CONN.
NOTHING ROLLS LIKE A BALL

WHAT'S AHEAD... in Metalworking

TRENDS

Metalworking still high but tapering gradually...

Metalworking production is graduallly tapering as the year progresses. But it still is remarkably high. *American Machinist* Production Index for February is now estimated at 158, with 1947-1949 taken as 100. That is two points below January and 22 points below a year ago.

Electrical machinery is making one of the best showings in Metalworking. At the top, however, in performance, despite cutbacks and stretch-outs, is the aircraft industry. It has been doing better relatively than any other segment of the metalworking industries.

The low demand for capital goods continues to be the biggest drag on metalworking operations.

The McGraw-Hill index of new orders for machinery, however, is believed to have bottomed out in the final quarter of 1957. After seasonal adjustment, incoming new machinery business is expected to be higher in each succeeding quarter during '58.

Nevertheless the dollar volume of new orders for machinery probably will run 5% lower this year than last.

Farm machinery sales are off, but not badly, from previous levels. Implement demand is better than that for farm tractors.

Though no records will be broken this year, and last year's volume probably won't be attained, 1958 should be a pretty good year.

Sales executives of farm equipment companies are encouraged after having made a swing around the country talking to farmers and dealers. Serious crop damage from recent bad weather has been mostly confined to the South.

Inventory cuts hurt parts makers . . .

Auto parts people have felt badly the policy of car makers of cutting their inventories to bare minimums. Whereas Detroit usually maintains a 45-day stock of parts, it has let the supply dwindle to 15-20 days. The result is that when auto companies order parts, they want immediate delivery.

Auto slump hits steel, too . . .

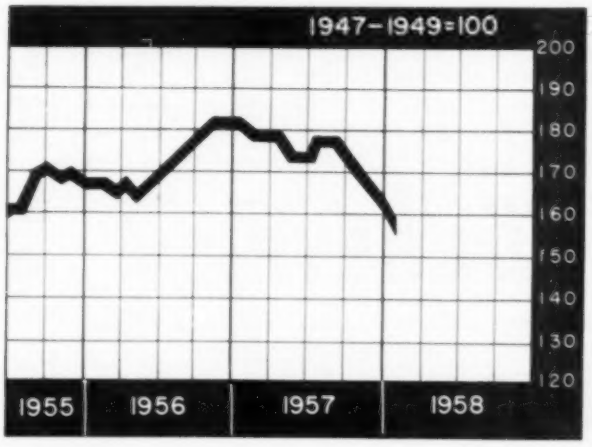
The auto companies are cutting down on their steel buying, as well as parts buying, and this has had a dampening effect on the steel production outlook for this month, which is usually a pretty good one for the steel people.

But now, with auto buying off, and even despite some pickup in general metalworking orders, few if any steel mills will achieve the production rates they had hoped for earlier this year. Tonnage on steel makers' books for March is less than it was for February, and until Detroit begins to sell autos again, they see no pickup.

Makers of nuts, bolts and fasteners, on the other hand, think that they hit bottom in February and a general upturn has started. While business today is 30% below year-ago levels, it's running 25% ahead of last month.

Aircraft parts business is a bit spotty just now. One top manufacturer is recalling workers at a rate of 50 to 60 a week to work on jet parts. It's not so much that new orders are causing the call-backs—rather, old orders that were cut back last fall have been rescheduled.

But another aircraft parts maker claims that the long lead-time required to produce its particular line of parts will see to it that even if procurement orders rise sharply today, no upturn will be felt at least through first half 1958.



158

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	FEB. Estimated	JAN. Preliminary	DEC. Revised	JAN. Year Ago
Total Index	**158**	**160**	**164**	**180**
Machinery	133	136	156	
Electrical Machinery	186	189	207	
Autos	120	136	146	
Other Transportation	329	312	352	
Other Metalworking	135	141	143	

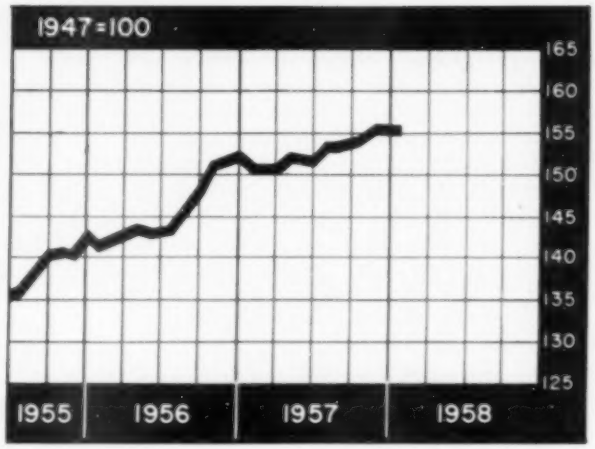
TRENDS

WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	FEB. Estimated	JAN. Preliminary	DEC. Revised	JAN. Year Ago
Total Index	**156.2**	**156.2**	**156.2**	**151.1**
Metalworking Machinery	**183.0**	**183.0**		**174.5**
Other Machinery exc. Electrical	**166 5**	**166.4**		**159.7**
Electrical Machinery	**157.4**	**157.1**		**152.0**
Fabricated Metal Products	**146.6**	**146.8**		**143.1**

156.2



Construction upswing will bolster business...

Home building and public construction will provide welcome stimulants for the economy.

All told—despite a drop in business spending on new plant—construction expenditures this year will register a gain of about $2 billion over 1957's $47.3 billion total.

Two key factors underlie the brightening construction outlook. First, the federal highway program will move into high gear in 1958. Second, credit is now more readily available, and at far better terms, than it was last year.

In 1957, with the program still largely in the planning stage, expenditures on the federally sponsored interstate road network totalled only $250 million.

This year, as large-scale construction begins, outlays will shoot up to $850 million.

Easier money will particularly benefit state and municipal projects and private home building. High borrowing costs prevented many cities and states from initiating building programs last year. But the decline in interest rates now makes a good time to float bond issues.

In the private sector, total housing starts tie in very closely with fluctuations in the number of residences built with government guaranteed or insured mortgages. The government places a ceiling on federally backed housing loans. Thus, when money is scarce and expensive, investors shy away from such loans. This was the case last year when government backed private housing starts fell by over 160,000—a 35% decline from 1956.

Easier money, however, has again made VA and FHA mortgages attractive propositions. And applications for FHA commitments and requests for VA appraisals increased sharply in January —a most encouraging sign. Private housing starts in 1958 should increase by a healthy 6%.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	129.6	129.0	152.0
Steel ingot production (thousand tons)	1,468	1,373	2,456
Electric power output (million Kilowatt hours)	12,338	12,417	11,928
Production of automobiles and trucks	117,929	128,751	169,083
Engineering construction awards (Eng. News-Record, millions)	$304.7	$338.5	$321.2

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	234	233	200
Vacuum cleaners sales (thousands of units)	251	329	300
Washers sales (thousands of units)	260	369	358
Household electric ranges sales (thousands of units)	73	69	79
Radio production (thousands of units)	1,689	1,983	1,382
Television production (thousands of units)	575	662	680
Gear sales index (1947-49=100)	165.3	207.0	216.2
Foundry equipment new orders index (shipments, 1947-49=100)	59.6	145.3	121.0
New orders for non-electrical machinery (1950=100)*	125	122	156
New contracts for industrial construction (1950=100)*	99	80	203

* Seasonally adjusted

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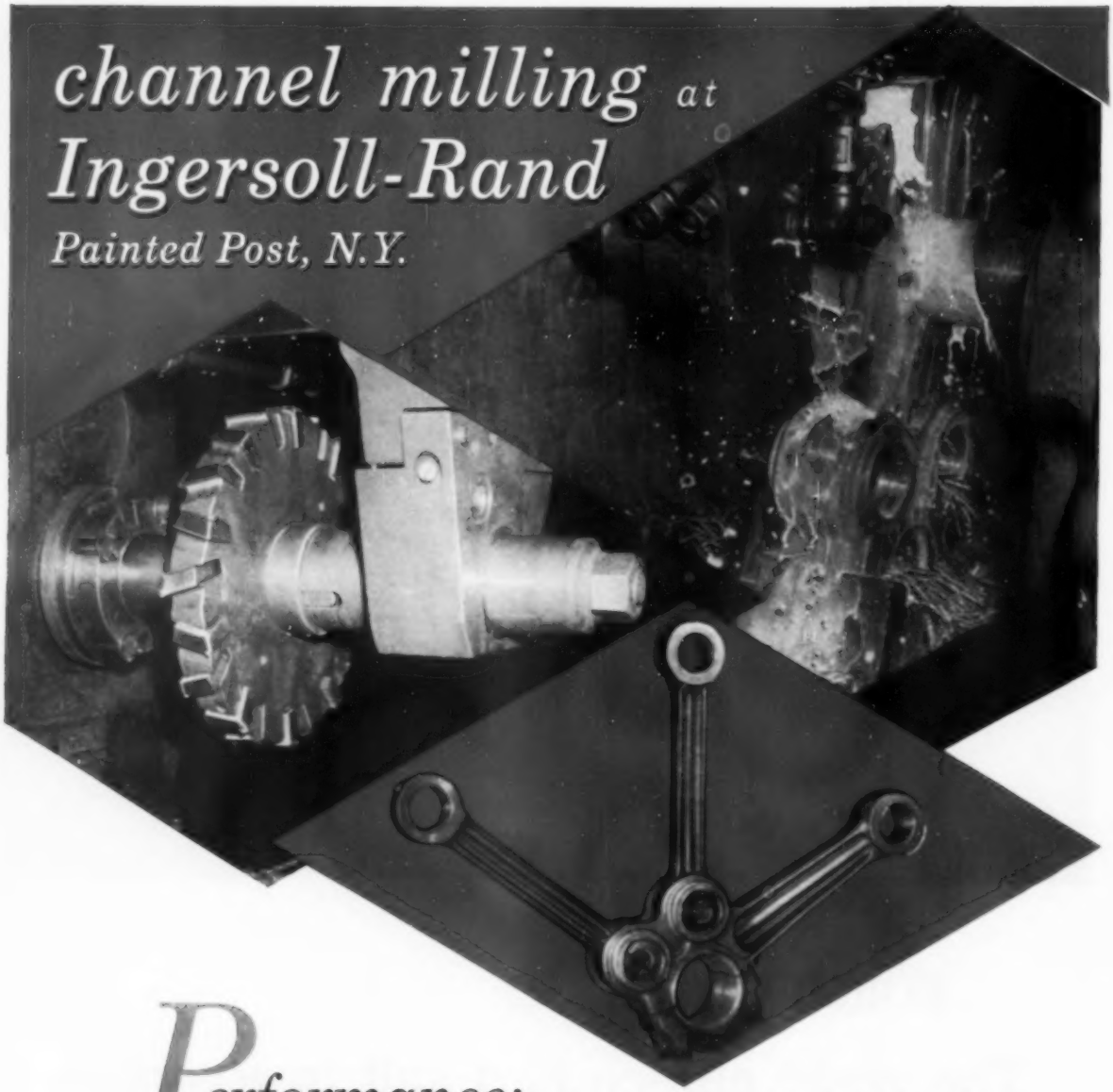
channel milling at Ingersoll-Rand

Painted Post, N.Y.



Performance: With one pass, the cutter takes the full depth of 2¾" cut at 15 rpm, 64 surface feet per minute. *Objective and Operation* — Get the metal out in the fastest, cheapest way possible. A job for a modern milling machine. *Workpiece* — Drop forged steel master connecting rods for stationary SVG gas compressors, widely used in oil field work to re-pressure wells, pipelines, and so forth. *Cutting Tool* — A 16-inch O K alternate angle or staggered tooth milling cutter with high speed steel blades set at the correct axial and radial rake to give a shearing action and free chip flow. O K tapered and serrated blades combine maximum strength with ease of replacement and adjustment for wear. ¶ This is just one of hundreds of metal removing operations successfully performed with O K cutters at Ingersoll-Rand plants.

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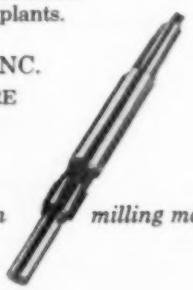
400 ELM STREET, MILFORD, NEW HAMPSHIRE

OK *modern milling* *cutters for* *modern*  *milling machines*

American Machinist
MAGAZINE OF
METALWORKING PRODUCTION • ESTABLISHED 1877

Time To Get Going

You are a metalworking production man in charge of a shop. You need some new machines badly. You get quotations on them, make your choice, and are ready to place the orders.

All that is lacking is the blessing of the front office—the general manager and treasurer. That is where you run smack into trouble. They tell you, "We'd better wait a while and see what happens. We'll buy those machines later."

You feel let down . . .

You think that yours is a special case. And that is where you are wrong. Your situation is not much if any different from that in hundreds of metalworking plants today.

So you have to do with what you've got. You hope to order the new machines as soon as the front office decides to loosen the pursestrings. Meanwhile the production equipment industry is deep in a recession because of the wait-and-see policy of you, and you, and you, and a thousand other companies.

Well, just how long does the front office intend to sit on its hands? It may be good business to play it safe up to a point. But if it intends merely to sit out a recession, and every other front office in Metalworking decides to do the same thing, the effect is going to be devastating. You won't have to wait until an H-bomb is dropped to make for the underground shelter. Better do it now.

It is hard to believe . . .

that metalworking management in the aggregate can be that suicidal in its policy. If ever there was a time for solid courage, daring action and a measure of risk, it is now.

Plush periods, such as we have just been through, inevitably breed inefficiencies, waste, high costs, perhaps relaxed and even careless supervision. What a chance to weed out all of this! Part of the operation should be to weed out the inefficient machines, replacing them with those that not only pay their way but earn a handsome profit.

You say, "But what can I do? My hands are tied until my big bosses get ready to spend some money." There is plenty that you can do. You don't need to twiddle your thumbs like your bosses. Get going.

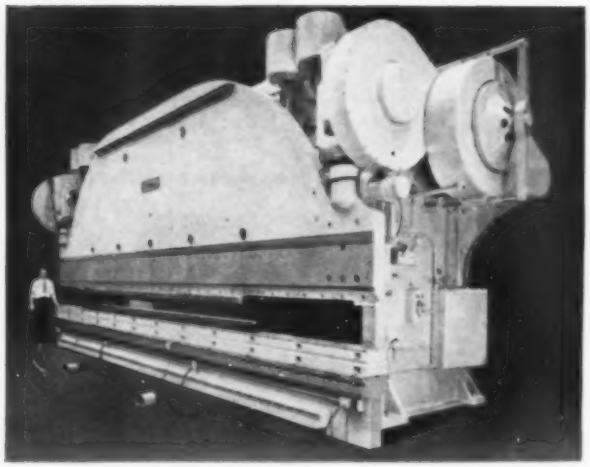
For one thing, call in the sales engineers of builders or distributors of production machines and ask them to help you figure out all the reasons why an investment in new machines will pay off generously. Then gather together the evidence and ask to present it to your top management.

Go a step further . . .

Invite the sales engineers to come in and study your entire production situation. Have them point out where profitable replacements can be made and why. They know their products, they get around a lot, and they and their organizations are specialists in helping to solve production problems.

If you will go through with such a program, you will be much farther along than you would be otherwise. You also stand a good chance of knocking your top management people off dead-center and get your own company going again. Nothing could be healthier for the economy than for this action to happen in thousands of metalworking shops across the nation.

Burnham Finney EDITOR



How press brake construction affects job costs

Only accurate machines can make accurate bends. The accuracy obtainable from a press brake begins with its structural rigidity. Cincinnati Press Brakes give you maximum accuracy and rigidity because of these construction features:

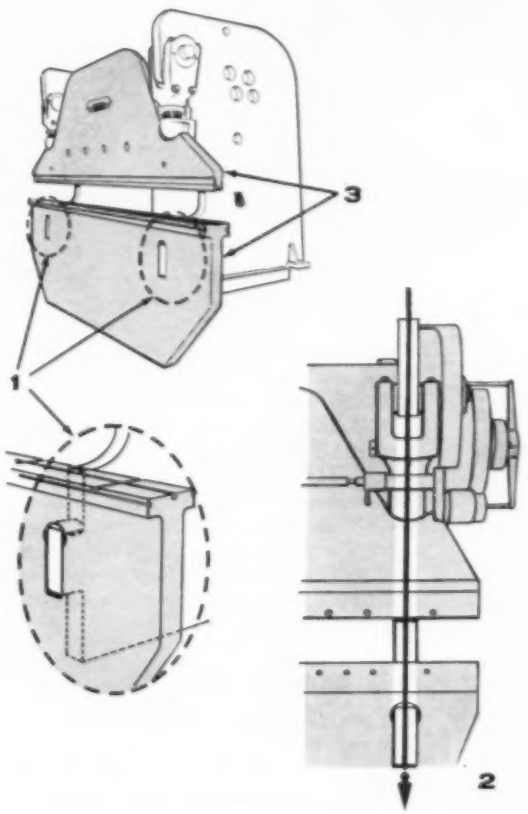
1. Interlocked construction—The bed is supported directly by the housings, by means of hand-scraped bearing shoes. No welds are used as load supports, so every Cincinnati is free from welding strains.

2. Center line loading—Since the Pitmans which drive the ram *straddle* the housings, weaving of the frame and cramping of the ram slides and shaft bearings is eliminated. All operating forces are contained within the housings.

3. Deep beds and rams—It's a simple engineering fact that the rigidity of a press brake's ram and bed increases approximately as the cube of the depth. For this reason, most of the weight of the ram and bed of a Cincinnati Press Brake is disposed in depth, rather than thickness. Tests prove their working surfaces remain parallel within .005" under capacity loads.

To you these construction features mean money saved in the long run. A Cincinnati Press Brake is more accurate than other makes when you buy it . . . and will stay that way throughout its long life.

Write department A for Catalog B-5.



Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio

Nose cones . . .
for satellites of the Explorer design are cold formed by roll flowing on a Floturn machine at Lodge & Shipley. Of Type 430 stainless, as-rolled finish is 4 to 5 mu-in. Two stages of rolling complete the piece

Wall thickness . . .
which ranges from 0.013 to 0.094 in., is gaged with a Vidigage ultrasonic vibration tester as final step. During forming, a vernier height gage is used to check length and a ball micrometer measures thickness

Explorer opens production paths too!

NEW YORK, N Y—"Roll flowing, so named to set it apart from conventional roll forming techniques, is one of the outstandingly important metalworking methods for tomorrow." These are the words of Colonel John Dick, Chief, Manufacturing Methods Branch, at the USAF's Air Materiel Command in Dayton. He went on to say that we are only beginning to foresee the potential values in this comparatively new approach to forming metals.

With these words hardly out of the colonel's mouth, reports have it that the Army's "Explorer"—our advance guard into the space age—is fitted with a nose cone roll flowed from type 430 stainless steel. Now circling the Earth every 115 minutes, this bullet-shaped satellite is 80 inches long and six inches in diameter. Its life expectancy is now measured in years.

The blunt stainless-steel nose cone not only serves as the prow of the satellite but actually as the nose cone for the entire Jupiter-C during initial acceleration. Army plans are to fire a second Jupiter-C vehicle in an attempt to place in orbit a second satellite of similar specifications. This next satellite will contain more scientific equipment, yet it will weigh the same 30 pounds as the Explorer. Launching is expected sometime in March.

While the concept of space travel staggers our imagination, the materials of space vehicles are reasonably conventional. Republic Steel's 430 stainless, for example, is popularly used for automotive trim. It was selected for the nose cone because of its high tensile strength and resistance to temperature extremes, even when used in thin gages for lightness. Its high resistance to corrosion is a valuable adjunct to its other metallurgical qualities.

Floturn Process Used

Roll flowing of the nose cone was done by the Floturn process at the Lodge & Shipley plant in Cincinnati —where the process was developed. The piece was cold formed in three basic steps: The blank is dimpled at its center to provide a locating point for the mandrel as the first operation. The square blank is 0.093 in. thick and the metal is flowed over a 25 degree mandrel, to provide the first nose-cone configuration. After trimming this conical shape's base, the cone is stress relieved by annealing. Then a second roll flowing operation completes the form except for final trimming.

Floturn is basically a cold rolling process in which the metal is displaced parallel to the centerline of the part being formed. This movement differs from the displacement in a cold-rolling mill where the metal is moved longitudinally. This method produces helical displacement as the work revolves. Metal is moved by the action of the roller against the blank to be formed which, in turn, is backed up by the mandrel. The roller is actuated by mechanical or hydraulic forces.

Among the metallurgical advantages of the process are effects similar to cold rolling. Granular structure is compressed and refined; yet flow lines are unbroken. Thus, considerable strength and hardness are added to the shape. Compared with deep drawing, for example, internal stresses are minimized and are virtually uniform. No potential or actual points of failure are produced in the metal. Complete stress relief is obtained by standard annealing methods. Roll flowing of most stainless steels provides a surface finish as low as 4 to 5 microinches.

General Dynamics Is Top Defense Prime

WASHINGTON—Two major conclusions show up in the Pentagon's latest listing of top defense contractors (see table):

- Almost all the 100 leading companies now hold contracts for development and production of jet aircraft, missiles, and ships or for related equipment and facilities—construction of airfields and missile launching sites and manufacture of electronic gear and fuels. The volume of contracting for heavy ordnance, tanks, and other so-called conventional arms continues to drop.
- As a result of this trend, prime contract awards are being spread more than ever among newer companies. For instance, during the latest periodic listing, January 1955-June 1957, the 100 top firms took up 67.7% of total prime contract awards, their smallest share of new business since the listings were started in January 1955. In the preceding two-year period, the 100 top companies received 69.6% of new defense business.

On a cumulative basis—total prime contracts from July 1950 to June 1957—General Motors ranks first, with $7.2 billion worth of prime awards or 4.5% of total defense business placed since Korea.

Following GM on the cumulative listing:

Boeing, $7 billion; United Aircraft, $5.8 billion; General Electric, $5.7 billion; General Dynamics, $5 billion; North American Aviation, $4.7 billion; Douglas Aircraft, $4.5 billion; Lockheed, $4 billion; AT&T, $3 billion; Curtiss-Wright, $2.6 billion.

These 10 top contractors accounted for 31.1% of the $159.5 billion worth of prime contract awards let since Korea.

In the previous cumulative listing, ending December 1956, GM had dropped to second place for the first time. The company's return to the top spot stems mainly from heavy contracts to GM's electronic unit, the AC Sparkplug Division, for production of inertial guidance systems for the Air Force's Thor and Mace missiles and the Navy's Regulus 2.

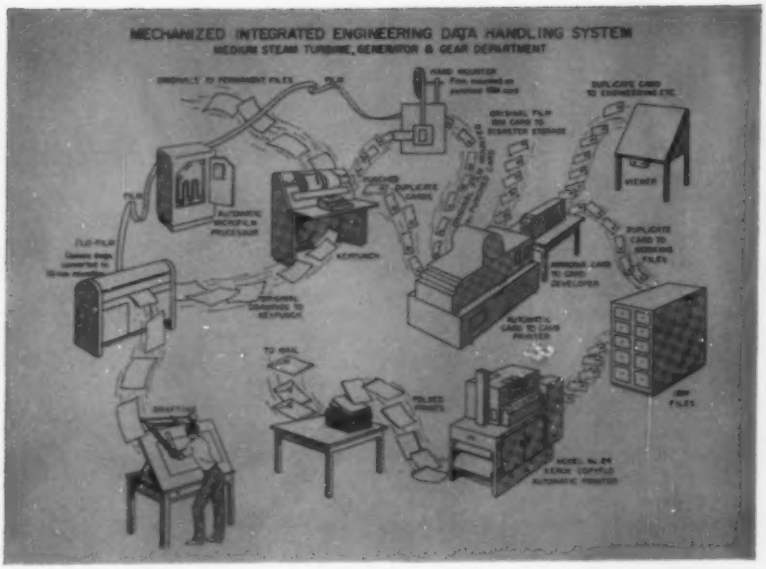
General Dynamics' eminence in the latest contractor listing reflects the company's comprehensive role in the defense program, as producer of the Atlas ICBM, the B-58 medium bomber, the F-102 and F-106 fighter-interceptor aircraft, and nuclear submarines.

Stressing the shifting complexion of military procurement, the Defense Dept says that one-fourth of the companies on the seven-year cumulative list of leading contractors have been displaced by other firms who figure in the more recent 2½-year roster.

The 70 contractors said that during fiscal 1957 they subcontracted 56% of their military prime and subcontract receipts to other companies, paying out more than one-third of that total amount to small business concerns.

Here's how the top 50 rank

		Jan 1955-June 1957		Jan. 1955-June 1956	
RANK	COMPANY	Millions of dollars	% of total	RANK	% of total
1	General Dynamics	$2,358.6	5.3%	2	5.2%
2	United Aircraft	1,979.4	4.4	3	5.0
3	General Electric	1,928.0	4.3	4	4.1
4	Boeing	1,923.5	4.3	5	4.0
5	North American Aviation	1,840.5	4.1	1	5.2
6	American Tel & Tel	1,339.0	3.0	6	2.9
7	Lockheed	1,193.2	2.7	8	2.6
8	Hughes Aircraft	867.0	1.9	11	1.9
9	Douglas Aircraft	841.9	1.9	9	2.3
10	McDonnell Aircraft	816.2	1.8	10	2.0
11	Martin	772.0	1.7	13	1.6
12	Ford Motor Co	766.3	1.7	7	2.7
13	Curtiss-Wright	668.1	1.5	12	1.8
14	IBM	637.5	1.4	16	1.1
15	GM	585.4	1.3	14	1.3
16	Bendix Aviation	546.4	1.2	15	1.1
17	Chance Vought	456.4	1.0	17	0.9
18	Sperry-Rand	430.1	1.0	19	0.8
19	Raytheon	397.4	0.9	22	0.7
20	Republic Aviation	390.4	0.9	20	0.8
21	Standard Oil (NJ)	384.8	0.9	21	0.8
22	RCA	354.7	0.8	18	0.9
23	Northrop Aircraft	337.9	0.8	27	0.5
24	Avco Manufacturing	297.7	0.7	29	0.5
25	Westinghouse	284.0	0.6	31	0.4
26	General Tire & Rubber	256.8	0.6	24	0.6
27	Merritt-Chapman & Scott	233.3	0.5	25	0.6
28	Brown-Raymond-Walsh	231.0	0.5	23	0.7
29	Standard Oil (Calif)	227.8	0.5	30	0.4
30	Goodyear Tire	224.3	0.5	26	0.5
31	Bethlehem Steel	209.0	0.5	32	0.4
32	Bell Aircraft	193.4	0.4	41	0.3
33	American Bosch Arma	189.3	0.4	55	0.2
34	Philco	182.3	0.4	28	0.5
35	Continental Motors	180.3	0.4	34	0.4
36	Socony Mobile Oil	157.9	0.4	40	0.3
37	Texas Co	157.5	0.4	39	0.3
38	Fairchild	153.4	0.3	36	0.3
39	Collins Radio	152.0	0.3	35	0.3
40	IT&T	149.6	0.3	66	0.2
41	General Precision	146.5	0.3	33	0.4
42	Cities Service	143.5	0.3	37	0.3
43	Minneapolis-Honeywell	142.6	0.3	45	0.3
44	Bath Iron Works	142.4	0.3	65	0.2
45	Chrysler	137.8	0.3	80	0.2
46	Burroughs	136.9	0.3	43	0.3
47	Olin Mathieson	129.4	0.3	47	0.3
48	Hayes Aircraft	125.4	0.3	48	0.3
49	Tidewater Oil	123.3	0.3	44	0.3
50	Garrett Corp	113.2	0.3	64	0.2



Here's how GE files, reproduces millions of blueprints a year . . .

World's biggest Copyflo machine turns 1 x 1½ in. negatives into 24 x 32 in. drawing reproductions in final stage of General Electric's mechanized blueprint filing and copying setup at Lynn, Mass

From spycatching to crosshatching, revamped OSS system helps GE turn out...

Blueprints by the Millions

LYNN, MASS—Nation's biggest and most mechanized commercial blueprinting facility, now in operation here at General Electric's Medium Steam Turbine, Generator and Gear Department, is expected to save the company as much as $100,000 a year.

In the year or so in which GE's new system has been in operation, it has located and reproduced something like 1.4-million blueprints from company files, some of them dating back to 1892. Indirect savings are probably much greater—simply because engineers in GE plants across the country now have up-to-date blueprints on hand when they need them, eliminating time wasted in waiting for blueprints to arrive.

Still tagged with the unwieldy title, "Mechanized Integrated Engineering Data Handling System," the operation combines latest microfilming, punched card and instant electrostatic copying methods. It's an offshoot of a World War II process developed by the "cloak-and-dagger" Office of Strategic Services to file its hundreds of thousands of photographs, yet at the same time keep them available for instant use. Idea then was to mount the photos on punched IBM cards.

Then last year the Navy came up with a paper-shuffling system for keeping track of its blueprints—a system that cut 80% from the cost of turning blueprints into working drawings. That development went into GE's process, too. Here's how the system works:

Drawings are fed into a machine equipped with a Flo-Film Model 90-05 camera, are photographed as they pass before the lens. Film is then processed like any 35-mm film.

IBM Card System

Drawing then moves on to a station where an IBM card is punched with the drawing's number and other manufacturing data. On the left side of the IBM card is a hole with special mounting edges. The 35-mm negative is mounted in it.

The card is then run through an IBM 519 machine to reproduce its punchings on another IBM card, which has an ozalid negative mounted in its left center portion.

Then the original silver nitrate negative card and the copy are run through an IBM 522 interpreter. This duplicates the data from the original on the duplicate card.

Both cards then go into a Filmsort automatic card-to-card printing machine, and the impression made on the original silver nitrate negative is transferred to the ozalid duplicate.

The original negative IBM card goes to a GE security vault in another state. This insures continuity of production in the event that the ozalid negative is destroyed by fire or other disaster.

IBM cards with the ozalid negative attached are kept in 27 cabinets —40,000 cards to a cabinet. If the drawings themselves were stored, they would take up 6000 sq ft, the ozalid IBM cards instead take up only 1500 sq ft.

When someone in a GE plant wants a print of a drawing, he phones, teleautographs or sends a messenger to the file office, simply giving the number of the desired drawing. A receiving unit notes the number and file operators pull out the ozalid negative and make out an order slip.

Plant personnel requesting blueprints can also dial a special number which is connected to two tape recorders in the file room, giving the requestor's name and the desired blueprint number. These tapes are monitored hourly.

Once the negatives are pulled from the file, and the orders attached, they go to the automatic printer—a

Model 24-1 Xerox Copyflo machine, largest of its kind in the world. Using negatives only 1 x 1½ in., the printer can produce drawings up to 24 x 32 in.

Within the machine, a coated drum is charged with positive electric ions. The ozalid negative is projected onto the plate and the positive charges disappear in those areas exposed to light projected through the negative.

Drum is then brushed with a negatively charged powder, which clings to the drum area that has discharged the positive electricity. A positively charged sheet of paper is pressed against the negatively treated drum, picking up the powder, which forms a direct positive image on the paper. Paper, with powder attached, is heated for a few seconds to fuse the powder and form a permanent print.

GE speeds up the operation by feeding the paper in and out of the printer on rolls. The rolls are then sliced to desired length and the prints go into folders for internal mail delivery.

GE estimates the department at Lynn has by now reproduced about 60% of all the negatives in its possession. Too, it has received steam-generator and marine propulsion drawings from other GE plants.

Under GE's old reproduction system, common to most companies, the department produced some 3.5-million sq ft of prints. Last year alone, with the new system, the department turned out upwards of 4 million sq ft of reproductions.

Not only that, GE plans to team the system up with a computer. When this is done, the machine can receive an order a score of different ways, pull the correct ozalid card from the bank, run it through the automatic printer, and then package the print for mailing. The only people needed in the entire setup will be those who sort the packaged prints into the right mailbags.

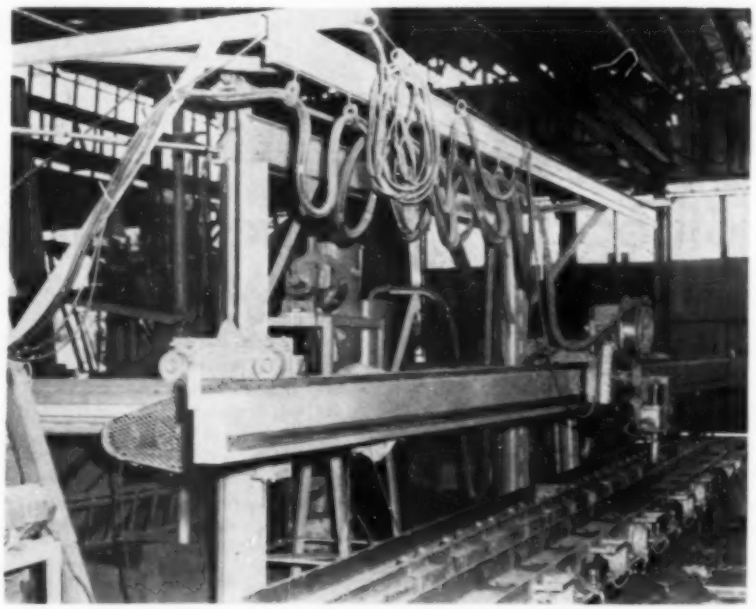
Engineering School Enrollment At All-Time Peak

URBANA, ILL—Although U S engineering education methods have been roundly criticized recently for their failure to produce as many engineers as Russia, engineering enrollment in accredited U S schools reached an all-time high of 257,777 students in the fall of 1957.

This fact and others were revealed late last month by a survey of 152 engineering colleges conducted by the U S Office of Education in cooperation with the American Society for Engineering Education.

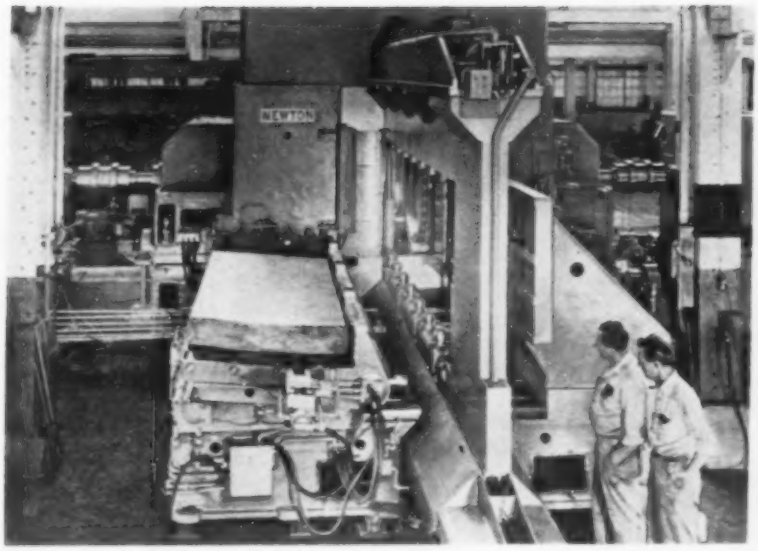
Other survey facts:

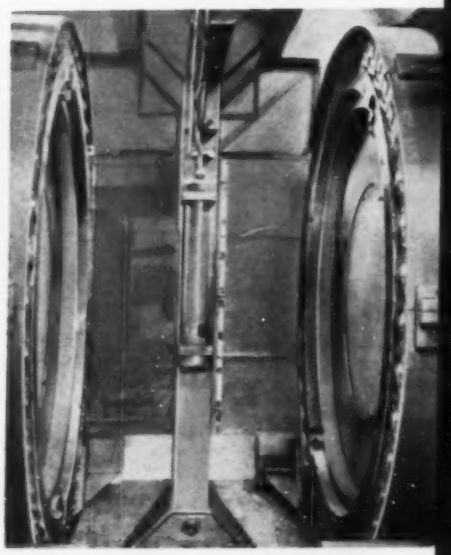
- Engineering enrollment has shown year-to-year increases since 1951.
- Engineering students comprise 12.8% of all male college enrollees.
- Enrollment of 67,071 freshmen engineering students in the fall of 1957 was 1% higher than in 1956.
- Part-time and evening undergraduate engineering enrollment increased 17.1% in 1957.
- Enrollment for masters' degrees increased 7.6% and for doctors' degrees 22.9% in 1957.
- Evening enrollment for doctors' degrees went up 30.7% to 690.
- ECPD-accredited schools awarded 27,748 first-level engineering degrees in the 1956-57 academic year, an increase of 17.8%.
- In the same period, the ECPD schools granted 5203 masters' degrees, an 11.2% increase, but 596 doctors' degrees—2.3% fewer.
- Highest percentage of ECPD-school-awarded engineering degrees were in electrical engineering.



Something New in Automatic Arc Welding

Here's an idea that won an award in the James F Lincoln Arc Welding Foundation Machine Design Competition for Harry S Powell of Pittsburgh-Des Moines Steel Co, Fresno, Calif. This 6300-lb manipulator for automatic submerged arc welding has a 33-ft rail mounted on lateral booms at either side of it. This allows the rail to be moved in or out independently as much as 6 ft at either end. And it gives an angular adjustment of up to 25.5° from parallel, for handling long welds in tapered girders and in other applications that require offline welding without repositioning of work. Flexibility is achieved by use of hinge plates and pins at the connections between booms and rail, plus a sliding hinge on one boom. Columns and booms are of 8-in. pipe, with angle-iron track rails welded to them. Rail is made up of two 10-in. channels welded together, with cold-rolled flat bars intermittently welded to the top and front faces for the rollers of the welding carriage—eliminating all machining on the rail. Vertical travel of the boom is 8 ft through the chain and sprocket drive from shafts mounted along the upper flange of the WF beam joining the tops of the columns (they're spaced on 20-ft centers, are 11 ft 6 in. high overall). Vertical and lateral boom movements are controlled through three pushbuttons on a pendant switch at operator's position. Control buttons for the standard submerged arc-welding carriage and head are also located there. Flux recovery unit is at rear





Duplex billet scalper goes to work at Kaiser Aluminum

What are claimed to be the world's first duplex billet scalper and the world's largest preset carbide-blade milling cutters have been combined to process aluminum billets in one-seventh of former time at Kaiser Aluminum & Chemical Co's Ravenswood, W Va, plant. With the new mechanized machine, 14-ft billets can be machined on both sides in less than 90 seconds—compared with 8 to 10 minutes required when sides were milled one at a time. The scalper, designed by Consolidated Machine Tool Division of Farrel-Birmingham Co, is equipped with 75-in. Wesson mills that remove aluminum chips at a rate of 5000 cu ipm. The cutters are directly connected to 1000-hp motors through couplings that allow axial adjustments up to 17 in. in increments of 0.01 in. Former blade-grinding time of 3 weeks has been cut to a few hours with preset insert blade cutters, and setup time has been cut from 12-15 hrs to 45 min. Cycle is automatic (left photo). Billets 8 to 16 in. thick, 30 to 54 in. wide and 6 to 14 ft long are released from a gravity-feed table, carried to a fixture that "sandwiches" the billet into position. Loading and centralizing leaves retract, and the 22-ft fixture advances to the billet at rapid traverse (1200 ipm) toward the rotating cutters (right photo). Just as billet enters the scalping chamber, fixture drops to preset feed rate. Cutter blades, rotating at 11,800 fpm act like fan blades inside the shrouds to generate a strong downdraft that throws chips into a conveyor pit. A service area 3.5 ft wide allows for cutter changing when heads are fully retracted. Swinging doors on entry side shut down the fixture feed motor if a billet is oversized. Carbide blades are mounted in magazines, which are held in hardened-steel blocks around periphery of cutter body ring. Angles are machined into the magazines so that cutting edges are correctly oriented when the magazine is put into place. Magazines also act as grinding fixtures. When the blades are resharpened they're loaded onto a magnetic chuck on a standard surface grinder table, and compound angles are formed on the blades by simple surface grinding. When the blades are sharp, the magazines are put back into the cutter

Who's Going to Heat-Treat Missiles—US or Private Plants?

WASHINGTON — Metallurgical Inc of Minneapolis is plugging hard to keep the government from building a heat treating plant on the West Coast. Reportedly, the government is considering building a $1.7-million dollar plant in conjunction with production of the Navy's solid-fueled IRBM Polaris missile. Aero-Jet General would operate the government plant.

Metallurgical claims to have the world's largest vertical drop bottom heat-treat furnace. It is not eager to have the government become its competitor.

Up to now, the company says it has heat-treated every large-diameter rocket motor case built in the U S. Over the past two years it has treated close to 450 motor cases for such missiles as the Jupiter, Polaris, Corporal, Bomarc, Sergeant, Vanguard, Atlas, Redstone and X-17.

Metallurgical Inc wants to keep this business as more of the missiles go into production. Cost, for example, for heat treating the two-stage Polaris engine is around $2200. It takes less than two hours to do the job. The metal is treated for 1600 F temperatures.

Navy, handling the job for the government, disclaims much of Metallurgical's story. They say that all the government is doing is putting in some heat treating facilities for purely research purposes And, the cost is not as high as the $1.7-million figure. Actually, the Navy says, Aerojet-General is putting up the buildings and the government is furnishing the equipment out of its industrial reserve stockpile.

Initially, the new facilities would be used for the Polaris program, but they could be tapped by other missile developers. The facility should be ready by summer.

Once the Polaris program moves into the production stage, however, Navy claims all contractors will get a fair shake at the business. But that still doesn't help Metallurgical Inc.

Drilling oil holes in engine blocks

Honing cylinder walls to close tolerances

Free China Builds Its First Autos

TAIWAN, FORMOSA—Free China's first automobiles—Jeeps and Jeep-type passenger cars—are today rolling off the lines at Yue Loong Engineering Co here in suburban Tapei. They're rolling off slowly by U S standards, to be sure (about 100 vehicles a month), but the mere fact that they're being produced at all here represents a victory over almost insurmountable difficulties.

Back in 1949, when the Chinese Communists forced Chang Kai-shek and his armies off the mainland and onto Formosa, C L Yen, owner of two large machine shops in Shanghai, saw the handwriting on the wall. A large number of new U S-made machine tools had just arrived for installation in his Shanghai plants. They were never installed. Instead, they were shunted on to ships bound for Formosa.

Home-Made Workforce

Along with them went Mr Yen and a small cadre of capable and experienced engineers from his plants. When they arrived on Formosa with the machine tools they found virtually no industrial facilities and no skilled metalworking workforce, but within a few years they had both.

Yue Loong engineers designed and built a modern plant in Tapei. And to staff it, they trained local vocational school graduates to become tool and diemakers and machinists. This group made every jig, fixture, cutter, gage and other tools needed for the production of automobile parts.

By 1956, Yue Loong was on production of pistons and rings, cylinder sleeves and leaf springs, even turned out some textile machinery. Later in the year came production of such other auto parts as valves, connecting rods, crankshafts, camshafts, oil pumps, bushings and bearings. They were good parts, were eagerly snapped up for Formosa's fast-depreciating cars.

The next step was inevitable—why not build a whole car? Yue Loong engineers turned out their first gasoline engine late in 1955—a 60-hp, 4-cylinder job. It was put on display at a local industrial exposition, ran for nine days (some 3.7-million revolutions) without developing any trouble. The next year, Yue Loong engineers put together their first jeep-like vehicle, manufacturing more than 70% of the parts in its own shops. Performance was excellent, cost less than that of imported Jeeps.

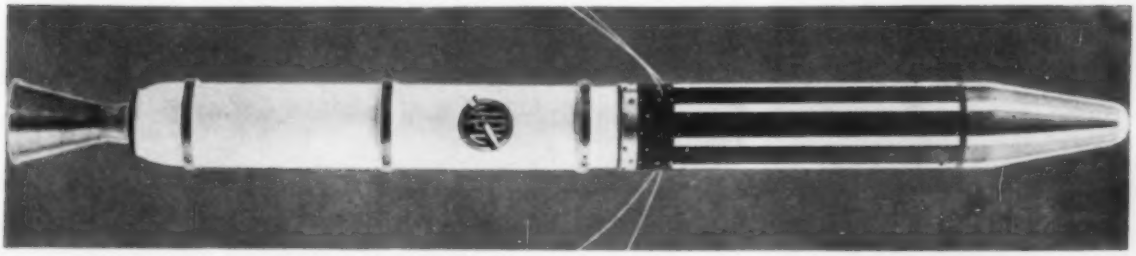
Quantity production began early 1957, and by April the first 20 jeep-type vehicles came off the line. In May, Yue Loong began production of jeep-type passenger cars, and of dual-purpose passenger and freight carriers.

Willys Is Helping Out

Yue Loong recently negotiated with Willys Motors for cooperation in its production of "Yue Loong jeeps." As soon as the Free Chinese and U S governments ratify the arrangement, Yue Loong will really go into mass Jeep production, with Willys supplying the blueprints and technical assistance. With the exception of a few parts from Willys, all components will be manufactured by Yue Loong.

But Yue Loong still has its troubles, mostly lack of finances and skilled workers, but its management is confident that it will soon be turning out quantities of trucks and sedans for the Far Eastern market.

FIELD REPORT...

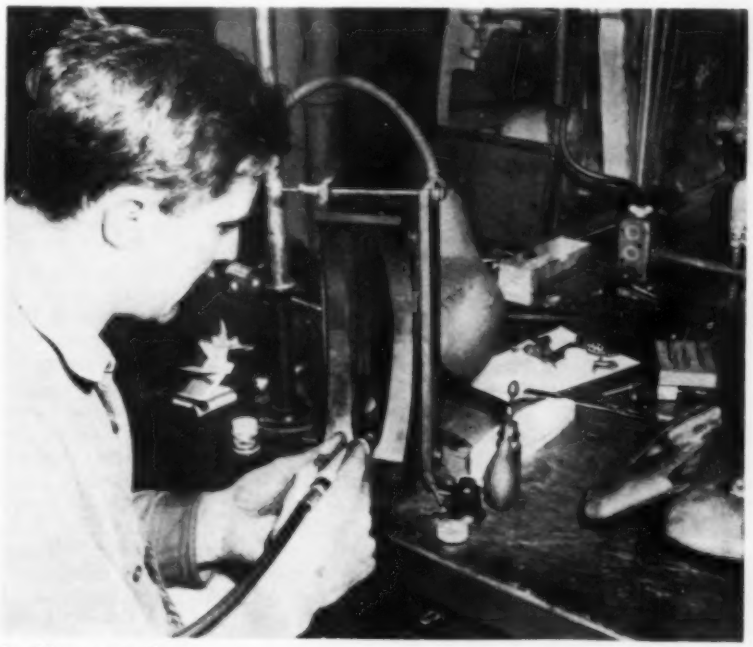


Norton Co's Rokide ceramic keeps the "Explorer" cool . . .

The white stripes you see on the forward end of this model of the first U S earth satellite, the "Explorer," are sprayed-on coats of Norton Co's Rokide ceramic, an aluminum-oxide compound. The striping keeps the temperature range inside the satellite somewhere between 50 and 86 F as it orbits through space. Developed 10 years ago by senior Norton research engineer W Maxwell Wheildon, Jr, Rokide is sprayed on by a unique process. Slender rods of pure aluminum oxide are fed into a metallizing spray gun. Using oxy-acetylene gas as a fuel, a jet stream of compressed air deflects an atomized spray of aluminum oxide from the molten rods at 500 F onto surface

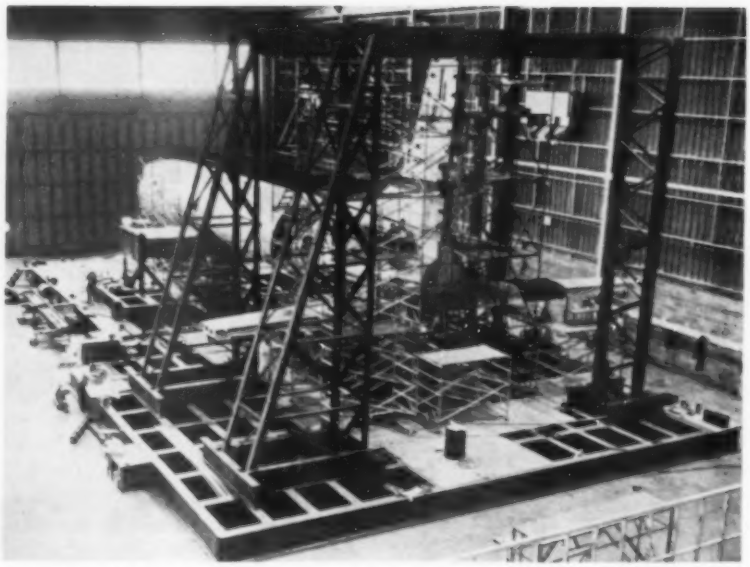
MIDWEST...

Cummins Engine Co, Columbus, has bought **Atlas Crankshaft, Inc**, Fostoria, Ohio. **Atlas**, a major **Cummins** supplier, will continue to operate in its present facilities . . . **Lear, Inc**, Grand Rapids, has a $4.9 million order from Air Materiel Command for the company's MARS (Master Attitude Reference System). Equipment, which supplies a highly accurate flight attitude reference, will be installed in Navy's Chance-Vought F8U-3 interceptor and Grumman F11F-1 interceptor . . . **Bound Brook Oil-Less Bearing Co**, Bound Brook, NJ, is building a million-dollar plant in Sturgis, Mich, for high-volume production of sintered bearings and parts. Company is also modernizing and expanding its home plant and research facilities . . . **Walmet Corp**, Madison Heights, Mich, manufacturer of cemented carbide cutting tools and related products, is installing a new ball mill which it expects will up production 30%. Mill has capacity of 800 lbs. It'll blend powdered metals such as cobalt and carbides of tungsten, titanium, and tantalum with less chance of contamination, and will reduce frequency of analysis and adjustment, according to company . . . **Inland Steel Co** is putting up an experimental pilot plant at its Indiana Harbor works for smelting of iron ore by a new process. Technique has been developed in the company's research lab; details are undisclosed since applications for patents are pending . . . **Ainsworth Manufacturing Co** (stamping, forming and assembly), **Precision Castings Co** (diecasting, machining and finishing), and **Globe Imperial Corp** (plastics) have merged and become the **Ainsworth-Precision Division** of **Harsco Corp.** Combined companies, with plants in eight cities, will be headquartered in Detroit . . . **Federal Machine & Welder Co**, Warren, Ohio, maker of resistance welding machines and Warco mechanical presses, has taken over the **Berkeley-Davis** line of automatic arc welding machines . . . **Maxwell Industries, Inc**, maker of precision tools and gages, has acquired **Kiener Cutting Tool Co** of Cleveland. **Maxwell** has moved from Macedonia, Ohio, into larger plant facilities in Ashtabula . . . **Formsprag Co**, Warren, Mich, manufacturer of overrunning clutches, has exclusive sales rights throughout the US to the Rawson clutch-coupling made by **O S Walker Co** of Worcester, Mass . . . **Allis-Chalmers** plans to build new engineering, development, and research labs on a 30-acre site in Greendale, Milwaukee suburb



Profiler at work . . .
Putting finishing touches to a 35-lb carbide-die insert, expert craftsman at Bronson & Bratton Inc, Chicago, uses a profiler to achieve close tolerances on the insert's 3-dimensional irregular contours. Insert, formed by GE's Metallurgical Products Dept, is for a 280-lb draw die to form an auto part

6000-mph manned aircraft . . . This is how a manned vehicle designed by Douglas Aircraft to travel 6000 mph some 140 miles above the earth will look. When? Douglas officials didn't say



Giant test bed . . . Built by Dominion Bridge Co, Montreal, to test Canada's biggest aircraft, the base structure of this test bed is a huge weldment weighing 250 tons—built up from 36-in. I beams. Because of the steel grid, limit loads can be applied to fuselage, center wing, and tail surfaces for static tests, and the entire aircraft can be loaded to destruction

near its West Allis Works. Among projects scheduled will be design, construction and testing of models, mockups and prototypes of nuclear reactors and associated equipment.

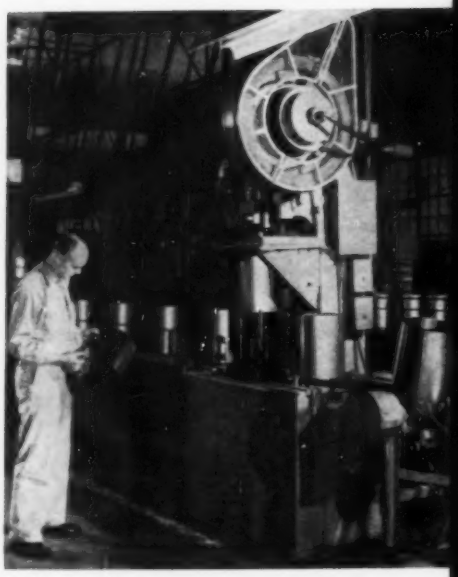
WEST . . .

Acoustica Associates, Inc, Mineola, NY, manufacturer of ultrasonic equipment, has opened a west coast plant and research center in Culver City, Calif. It'll serve both the missile and commercial fields . . . **Rheem Manufacturing Co's Aircraft Div** at Downey, Calif, has a contract (dollar value undisclosed) from **Convair** of San Diego to produce titanium pressure spheres for the Atlas missile . . . **Mare Island Naval Shipyard,** Vallejo, Calif, expects to hire several hundred additional workers as result of Navy order for nuclear submarine that will carry the Polaris ballistic missile. Present work force is about 9400 . . . **Bethlehem-Pacific Shipyard** at San Francisco has a $29-million contract from the Maritime Administration to build two freighters of a new type for American President Lines . . . Production of the Sergeant (successor to the Corporal), Army's new solid-propellant ballistic guided missile, has been assigned to **Sperry Gyroscope Co's Utah Engineering Laboratory** plant at Salt Lake City. Provisions have been made for additions to the existing 150,000-sq-ft facility if the program requires it . . . **A O Smith Corp's** plant in Anaheim, Calif, has been established as the **Aeronautical-Western Div** of the company. Facility makes aeronautical parts used by all of the armed services, plus equipment for the US and NATO navies . . . **Boeing** plans to hire several hundred engineers, most of them for the **Pilotless Aircraft Div** in Seattle where work is under way to accelerate pace of advancement of the Bomarc IM-99 missile. Company now has two recruiting teams in the field looking particularly for engineers with advanced degrees and electronics backgrounds . . . Largest single tract in the US zoned exclusively for industry was dedicated recently in Antelope Valley, a 2500-sq-mi area some 60 miles north of Los Angeles. Tract, made up of 16,080 acres encircles US Air Force Plant No. 42, already the site for extensive installations of **Lockheed, North American, Northrop,** and **Convair** . . . **Telecomputing Corp,** Los Angeles, has been awarded a $1 million addition to its existing contracts with Army Ordnance for nuclear warhead test equipment. Work will be handled by the firm's **Nuclear Instruments Div** in North Hollywood.

EAST . . .

General Dynamics' Electric Boat Div at Groton, Conn, will build two atomic-powered submarines equipped to fire Polaris guided missiles. (Third will be constructed at the Mare Island, Calif, Naval Shipyard). First sub, probably completed by **Electric Boat,** will cost between $105 and $110 million; cost of the next two is expected to drop to between $85 and $90 million. First deliveries are expected in 1960 . . . **Bendix Aviation Corp's Radio Div** has opened its multi-million-dollar engineering center near Towson, Md, as part of a $15-million expansion of its technical facilities. The 100,000-sq-ft structure houses personnel involved in radar engineering and development, military communications, research in navigation and missile systems, general engineering and development . . . **Pivot Punch & Die Corp's Punch Div** has moved to new, larger facilities. Extra room

"Tool-o-Rama" in Pennsylvania . . .
Although the paralyzing snowstorm that hit the East the week of February 19 kept attendance down, more than half of the 400 metalworking executives expected to attend Valley Supply & Equipment Co's "Tool-o-Rama" at Bethlehem, Pa, managed to turn up. Eight national manufacturers of precision tools were on hand to exhibit their products. Here, host Ernst Sussman, president of Valley Supply talks with exhibitor Fred Kalmbach, Jr, president of General Machine Co, Emmaus, Pa

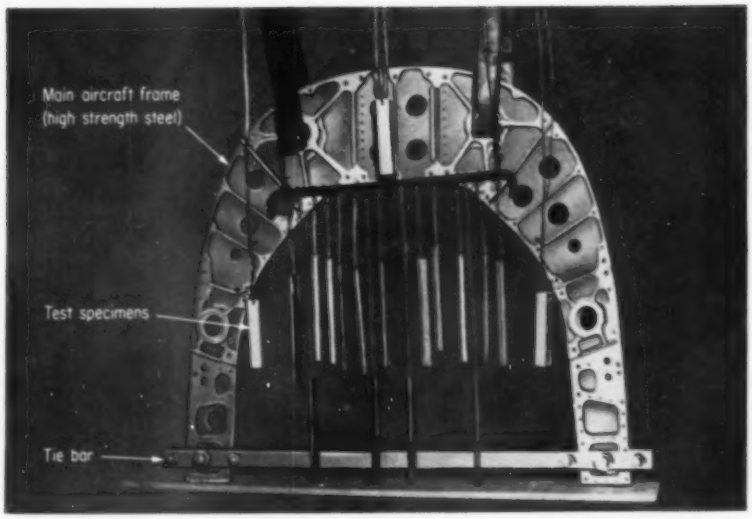


Pail stretcher . . .
This U S Steel-developed automatic sizing machine can stretch the body of a pail into a true cylinder, using 12 expanding die segments that cold-stretch the metal up to ⅛ in. circumference to form a perfectly round pail body

provides for production of expanded lines of commercial punches and Pivot's straight ground and whip-sleeve punches. All of the firm's operations are now consolidated at a single location—the expanded **Special Tooling Div,** 1254 Erie Ave, North Tonawanda, NY . . . **Barry Controls Inc,** Watertown, Mass, has bought physical assets and products of **Vlier Engineering Inc,** Los Angeles maker of special tooling accessories for dies, jigs, and fixtures. Company will continue operations as a Barry subsidiary under the name of **Vlier Engineering Corp** . . . **Black & Decker Manufacturing Co** of Towson, Md, has set up a new subsidiary company in Rotterdam. Firm, **Black & Decker (Nederland) NV,** will service the electric tool company's products in the Netherlands where **B&D** has had distribution for more than 30 years . . . UAW has demanded that **Ford Motor Co** begin immediate negotiations to deal with problems created by closing of the firm's Somerville, Mass, assembly plant. Shutdown affects 1500 workers . . . **Alcoa** will spend more than half-a-million dollars for new facilities at its Cressona, Penna, works, including installation of a 2500-ton vertical impact extrusion press, and additional equipment to turn out sheathing for conductor and co-axial cables.

SOUTH . . .

Douglas Aircraft has a $43.5 million contract for continuing production of Army's Nike Hercules guided missile. Order is from **Western Electric Co,** a prime contractor of the Army Ordnance Corps on the project. All fabrication of the surface-to-air missile will be done at **Douglas'** Charlotte, NC, plant . . . **Temco Aircraft** of Dallas has acquired controlling interest, through stock exchange, of **Fenske, Fedrick & Miller, Inc,** West Coast electronics company. The Los Angeles firm, a prime contractor for the military services, designs and manufactures automatic missile test equipment, telemetering calibration instruments, and missile guidance components . . . **General Metal Heat Treating, Inc,** Cleveland, will open a facility at Tampa later this year. It'll work on production and tool steels as well as other types . . . **Law-Barrow-Agee Laboratories, Inc,** of Atlanta, has been renamed **Law Engineering Testing Co.** Firm, a member of the **American Council of Independent Laboratories, Inc,** is one of the South's first organizations to put atomic energy to work in industry and uses radioactive isotopes for X-Ray-like inspection of castings, welds, and manufactured products . . . **General Electric** will build a 70,000-sq-ft distribution center at Birmingham, expects it to be completed early next year . . . **Lone Star Boat Co,** Grand Prairie, Texas, will put up a 20,000-sq-ft plant at Tallahassee, Fla, for manufacture of aluminum and fiberglass boats . . . **Southern Electronics Co,** Greenville, has plans for a new plant at Mosheim, Tenn; it'll turn out solenoid coils . . . **National Wire Products Corp,** Baltimore maker of wire reinforcing mesh, is building a $350,000 facility at Tampa. Some 10,000 tons of wire coils will be drawn and fabricated annually . . . **Fiat Metal Manufacturing Co,** producer of shower cabinets, metal doors and partitions, is starting a manufacturing operation in Albany, Ga. It'll be known as the **Georgia Receptor Co** . . . **Engineered Castings, Inc,** has begun operations in Miami. It's supposed to be South Florida's first precision aluminum and bronze casting plant.



Main aircraft fuselage frame... machined from a 5 Cr-Mo-V blocker forging bar was heat treated to 220,000 psi. UTS, in a 6-ft-dia vertical drop furnace 24 ft high. Tie bar prevented warping, spreading, or closing of the experimental frame. After heat treating, and removal of tie bar, the frame had spread 0.100 in.; however, because extra material was allowed, frame was successfully machined to within tolerances. Main frame is 52 in. high, 40 in. wide, heaviest section 4 in., and thinnest section 3/16 in.

Are tool steels the

Today, aircraft structures demand materials that must meet two basic requirements: strength and temperature resistance. This article presents for the first time design data directly related to current and anticipated future demands for high-strength steels for use at temperatures up to 1000 F. Our discussion centers on information about the formability, machinability, decarburization control, and heat treatment of hot-work tool steel in both sheet and bar form

JOSEPH H MAINHARDT, manufacturing research,
REPUBLIC AVIATION CORP, FARMINGDALE, N Y
in cooperation with
JOHN P WRIGHT, associate editor

The importance of retaining strength upon exposure to elevated temperature has focused attention on the application of hotwork tool steels for aircraft structures. The advantage of these steels over conventional high-strength steels is their resistance to loss of strength at elevated temperatures. This resistance produces the structural stability that overcomes aerodynamic and engine-heating effects occurring in high-speed flight. Since the softening of martensite is dependent on composition, different steels require significantly different tempering temperatures to arrive at the same hardness. The fact that hot-work tool steels can be tempered at higher temperatures, for the same hardness level, than ordinary high-strength steels permits them to be exposed to higher temperatures without softening.

Sheet and bar tool steel of Type H11 (5 Cr-Mo-V) has been chosen by Republic as the basic material

Unrestrained heat treated parts after heating to 1825 F for 30 minutes followed by an uninterrupted 800 F salt quench. Equalized in salt 5 min., then air cooled

Nickel-plated parts . . . (protection against decarburization) heat treated in a controlled atmosphere furnace became highly distorted. However, when parts were checked against a loft templet, no change in linear growth was noted, and a R_c 53 reading was obtained on all parts. These parts were then put through a double temper cycle (1100 F, 4 hr—1125 F, 4 hr) without further distortion or size change, and an acceptable hardness of R_c 40-41 was obtained. Hand working the hardened and tempered parts to remove distortion proved difficult. Note undesirable blistering of nickel plating, thereby affording poor protection against decarburization

Material 0.063 Halcomb 218
Heat treatment: salt austenized – air quenched, followed by first and second tempers
Distortion due to heat treatment
Hand worked before stress relieving
Rib
Heat treated at 1850 F – 1 hr – air quenched
Part and form-block fixture brought up to 1100 F, part placed in fixture and tempered at 1100 F for 4 hrs
Result: part not deformed and fits fixture snugly

Optimum results are obtained . . .
from heat-treat process that incorporates use of a salt pot for austenitizing. Two salt pots were required: one for austenitizing at 1850 F and one for interrupted salt quench at 800 F. Both pots should be of similar capacity and within close proximity of one another. Rib shown in photo is also Halcomb 218, 0.028 in. thick, copper plated, and heat treated in an endothermic atmosphere. Rib represents results obtained by another heat treating test that was performed to evaluate the efficiency of fixturing part during heat treating cycle

answer to high-speed flight?

for a considerable number of critically stressed structural parts in high-speed jet aircraft. This material was selected after Republic had conducted a research program for a material of sufficient mechanical properties at operating temperatures (1000 F) coupled with a favorable strength-density ratio. Because the application of this material is relatively new, little or no data could be compiled from industry-wide experience. Consequently, Republic set up a program to develop and design standards and optimum methods of forming 5 Cr-Mo-V in all probable manufacturing methods, including heat treating. Here are the important highlights of the manufacturing methods acquired as a result of this program.

SHEET AND PLATE

5 Cr-Mo-V steel is used in a hardened condition at elevated temperatures for aircraft construction. Material as received is in a hot rolled condition; however, effort is being made to supply the material to meet aircraft quality, free from pits, blisters, grooves, cracks, tears, seams, laminations or other defects detrimental to performance of parts. Slight surface imperfections that are completely removable without reducing section thickness below minimum dimensional limits are not considered injurious defects, provided they are removed before processing. Sheet and plate material is received in the annealed state, pickled and oiled. Surface finish most desired is one equivalent to a standard ID finish (scratch free); however, at the present time such a finish is not always obtainable. Maximum hardness does not exceed R_c 21. Where grit blasting is required for scale removal prior to pickling, grit size is limited to 180 mesh to prevent undue notching of the material.

PLEASE TURN PAGE ►

Fixture restrained heat treated parts after heating to 1825 F for 30 minutes and air quenching

Parts above were straight . . .
when removed from furnace but distorted as they cooled in air. Longeron curled inward upon release from fixture. Distortion was removed from parts by a hand-work refining operation that proved relatively easy in fully hard condition before tempering. Part was wedged open and remounted in same fixture and tempered at 1100 F for 4 hr and air cooled. Upon release from fixture, part maintained correct configuration. However, optimum results were obtained from heat treat process that uses a salt pot for austenitizing

Fig 2 . . . Blank is nested . . .
in fixture for forming and heat treating operation (Left to right —form block, plug and restriction plate)

Fig 1 . . . Edges of Blank . . .
are prepared prior to forming operation

Sequence of seven operations required for forming

Fig 3 . . . Blank and fixture . . .
are placed in 7500-psi hydraulic press ready for forming operation

CHEMICAL ANALYSIS OF MATERIAL

C	MN	SI	Cr	Mo
.35/.43	.30/.50	.90/1.20	4.75/5.25	1.0/1.5

V	P	S	Fe
.30/.45	.035 max.	.035 max.	Rem.

No surface decarburization is permitted for material thicknesses of 0.051 in. or less. For material thickness greater than 0.051 in. maximum total decarburization must not exceed 0.001 in. per surface.

PROTECTION AGAINST DECARBURIZATION

Decarburization control is accomplished with neutral salt baths, argon atmosphere, or copper plating in conjunction with endothermic atmosphere. Highest uniform results are accomplished with salt baths, because of accurate temperature control.

Commercial electro-chemical nickel and copper plating of parts (0.001 to 0.002 in. per side) failed to provide adequate protection against decarburization during austenitizing cycle. A current new method of copper plating has shown excellent results in providing adequate protection with good surface adhesion. Essentially this new method involves agitating the parts during the copper-plating cycle.

The use of dry hydrgen or disassociated ammonia with or without plating is not permitted. Argon protective atmosphere is restricted when possible to bright hardening furnaces with full-alloy muffles. Exit argon dewpoint is not allowed to exceed -40 F. Furnace is adequately purged to provide complete freedom from contaminating gases prior to introduction of work. Endothermic atmosphere is controlled to maintain carbon potential equilibrium relationship with the steel at the austenitizing temperature. Value for this steel is a dew-point of 47 ± 5 F. It has been found that large muffle furnaces are difficult to control to temperature limits of less than ± 25 F.

BEND RADII

Experience so far indicates that a minimum bend radius of 3T is required to offset any loss of fatigue life and to provide a more practical tolerance for production requirements. Bend-fatigue tests under tension were run on parts in the heat-treated condition to obtain bend-radii design data and the effect of inclusions.

FORMABILITY

Annealed 5 Cr-Mo-V has approximately 22% ductility that provides relatively small bend radii. In addition it can be easily hand refined and can be readily formed and machined in conventional equipment.

MACHINING

All normal operations such as drilling, milling, turning, shaping, and sawing are being done at speeds and feeds that are used for low alloy steel.

and heat treating Halcomb 218 (5Cr-Mo-V) . . . see photos 1 to 7

Fig 4 . . . Formed rib . . .
is removed from fixture

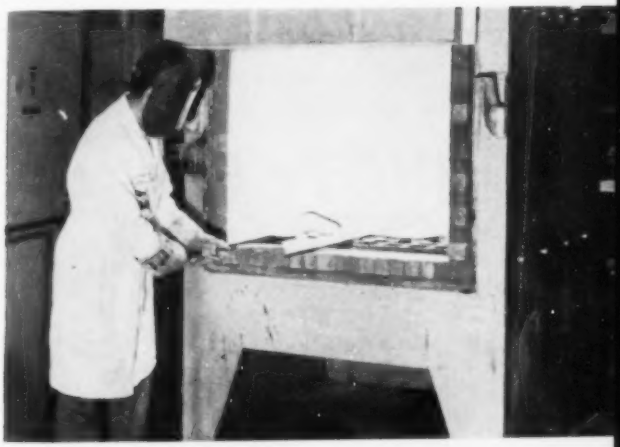


Fig 5 . . . After austenitizing . . .
in an endothermic atmosphere, part is double tempered

HEAT TREATMENT OF TYPE H11, 5 CR-MO-V SHEET

To obtain 180,000 to 220,000-psi tensile strength at R_c40 to 46, the heat treat cycle is as follows:

a. Preheat or stress-relieve at 1450 F for a period not less than one hour. Work is suitably protected against oxidation during preheat or stress-relieving cycle by use of neutral salt baths, protective atmospheres, copper plating or combinations thereof. Work is thoroughly cleaned prior to austenitizing.
"Note"—Work unprotected during preheat or stress relieving cycles subsequent to autenitizing in molten chloride salt baths must be thoroughly cleaned, for the introduction of small amounts of oxide will result in severe pitting.

b. Austenitize at 1850 ± 25 F for the time, based upon maximum section thickness, indicated by Fig. 1 of specification MIL-H-6875, except total furnace time shall not be less than 45 min.
"Note"—The rate of temperature increase shall be at the option of the heat treater and shall be governed by geometrical considerations (abrupt changes of cross-sectional area, etc) and tolerances.

c. Quench in still air or atmosphere to below 150 F.
"Note"—When geometric configurations, dimensional tolerances or abrupt changes of cross sectional area so indicate, the use of an interrupted quench into molten salt bath at 800 F for 20 to 30 minutes followed by air cooling to below 150 F is permissible.

Minor straightening if required should be performed during cooling from austenitizing, because the material in this condition is very ductile. Straightening should take place while the parts are cooling from a temperature range of 1850 to 600 F. Parts are loaded onto a preheated stress-relieving form block at a convenient temperature between 600 and 800 F and allowed to cool in air to 200 F. If necessary, additional hand refining to remove minor distortion can also be performed at this time, but not after part has cooled below 600 F.

Fig 6 . . . Fixture is heated . . .
to 600 F; part is at 1850 F and is immediately placed in the fixture prior to dropping to the martensite range (approx 500 F). Operator is handworking rib to a snug fit in the fixture

Please turn page for Fig 7 ▶

Note: Because of the steep slope of the tempering curve, it is desirable that furnace temperature be uniformly controlled to ± 10 F, if possible.

FIRST TEMPER

First temper should be accomplished immediately after quenching. Temper at 1050 ± 25 F for 4 hr min, and air cool.

SECOND TEMPER

Temper for 4 hr min; tempering temperature should be sufficient to produce the required mechanical properties but should in no case be less than 1050 F.

NOTE: The use of existing copper plate or nitrogen to prevent oxidation during the tempering cycle is permissible.

If final machining, grinding, or minor straighten-

Are tool steels the answer . . .

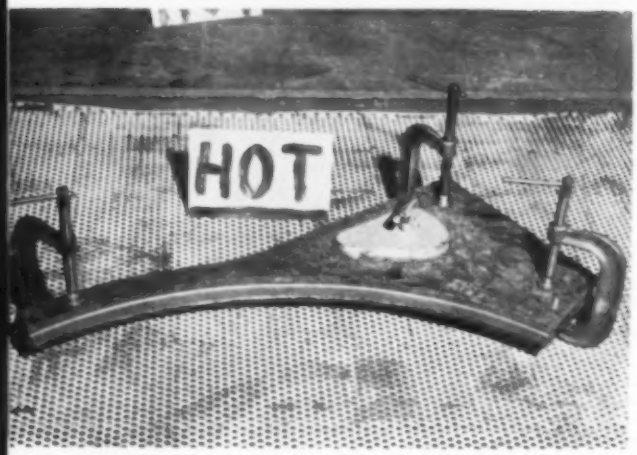


Fig 7 Rib remains in fixture . . . until cooled to room temperature. After the fixture and rib have cooled to room temperature, rib is removed. Parts made by this method are not distorted or oil canned. Rib then receives a first temper at 1100 F for 4 hr and a second temper at 1050 F for 4 hr. Part is then placed in cyanide and water to remove copper plating, because copper has a greater affinity for cyanide (in water) than it does for steel. Mechanical property tests consistently show an UTS of 180,000 min, yield strength of 155,000 min and an elongation of 7.0 min

ing operations are required after second tempering, parts must be stress relieved again for 4 hr at 900 ± 25 F, followed by an air cool. Nitrogen may be used to prevent oxidation.

No pickling, plating, phosphating, electro-chemical or chemical cleaning should be performed on hardened and tempered parts.

Heat treatment of Type H11, 5 Cr-Mo-V rod, shapes and forgings.

To obtain 200,000 to 240,000-psi tensile strength, the heat-treat cycle is as follows:

(a) Preheat at 1450 F for soaking period required in accordance with Fig. 1 of MIL-H-6875.

(b) Raise to an austenitizing temperature of 1825 ± 25 F.

NOTE: Rate of temperature increase shall be at the option of the heat treater and shall be governed by geometrical sectional area, etc, and tolerances.

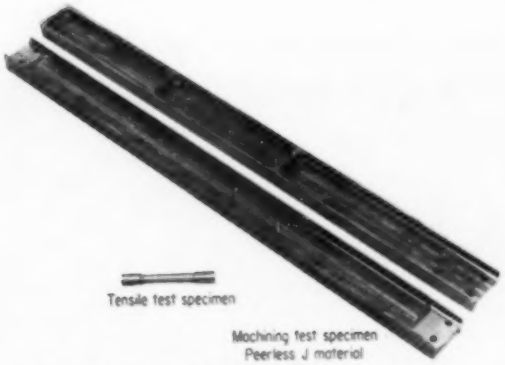
(c) Equalize, based upon max section thickness in charge, in accordance with time requirements specified in Fig. 1 of MIL-H-6875, and then soak at temperature for 1 hr min.

(d) Interrupted-quench into molten salt at 800 F and equalize for 20 to 30 min followed by still-air quench to below 150 F.

NOTE: Where cross-sectional area and geometric configurations indicate feasibility, it is permissible when using argon to atmosphere-quench in water-cooled zone of the alloy muffle, or when using endothermic atmosphere to air-quench the copper-plated parts. In all cases cooling should be continued to below 150 F.

(e) Double temper

NOTE: Because of the steep slope of the tempering curve, it is desirable that furnace temperature be uniformly controlled to ± 10 F, if possible.



To determine machinability . . . and surface-finish data of high-strength alloy steels, a material, Peerless J (Cr 1.36, Mo 1.59, W2.77, V1.35), available in bar form only, was selected for test purposes. These tests were run concurrently with the testing of Halcomb 218. Of all the die steels under study it was known that this steel had a high resistance to softening when tempered between 1050 to 1300 F. Machining this tool steel in annealed condition presents no problem. No warpage is encountered from machining stresses and no interstage normalizing operation is required. Carbide tools are used with speeds of 600 sfpm, without coolant. Parts shown above were machined from a bar 3x3x48 in. to determine test data for wall thickness, depth of pockets, rigidity of section, reamed holes, etc. Peerless J, heat treated to 250,000 psi, maintains its strength to same degree as Halcomb 218 heat treated to 240,000 psi. At and above 1000 F it has superior tensile and yield values compared to Halcomb 218. In effect, Peerless J extends the design limit for these steels to 1100 F

FIRST TEMPER

First temper should be accomplished immediately after quenching. Temper at 1050 ± 25 F for 4 hr min, and air cool.

SECOND TEMPER

Temper for 3 hr min; tempering should be sufficient to produce the required mechanical properties but should in no case be less than 1050 F.

NOTE: The use of existing copper plate, or nitrogen to prevent oxidation during tempering cycle is permissible. Minor straightening if required may take place between first and second tempers.

STRESS RELIEF REQUIREMENTS

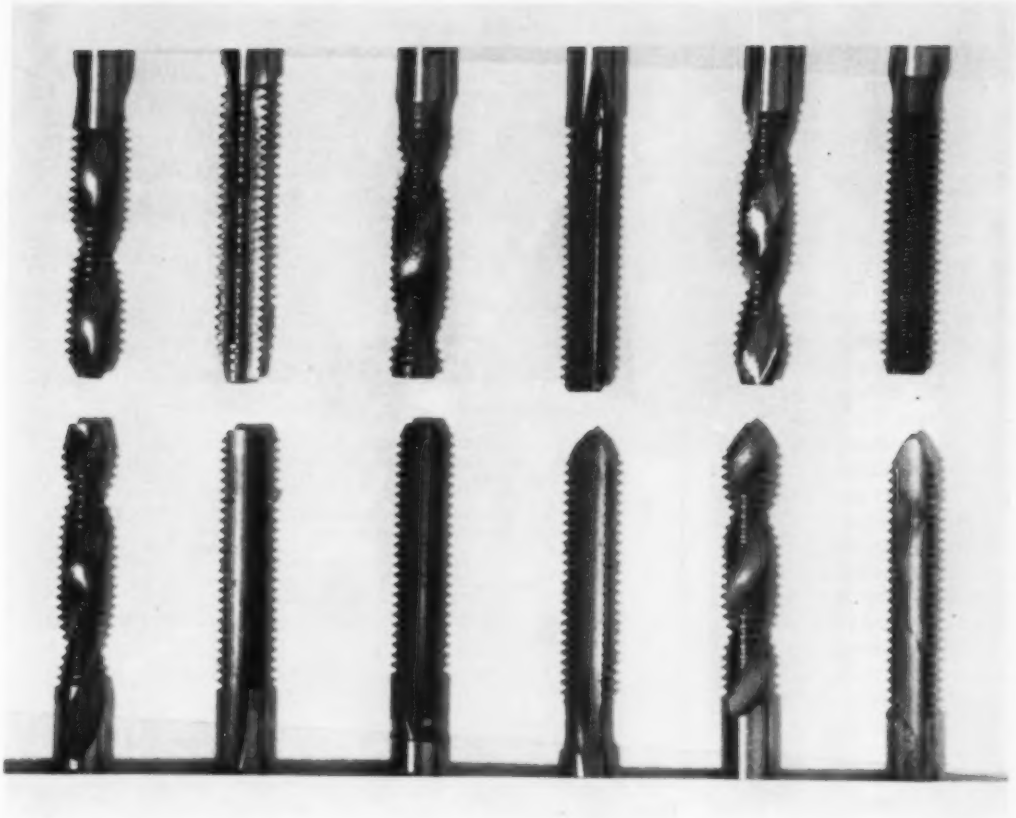
If final machining, grinding, or straightening operations are required after second temper, parts must be stress-relieved for 8 hr at 900 F, followed by an air cool.

CURRENT PROBLEMS

Forming and machining of 5 Cr-Mo-V in most instances is no longer a problem. Remaining problems are in heat treating, as well as dimpling of parts after heat treating.

Producers of H11 hot-work tool steel (5 Cr-Mo-V) for aircraft applications:

	Trade Name	
Crucible Steel Co	Halcomb 218	Sheet & Bar
Firth Sterling	H D W 22	Bar
Latrobe	Dycast 21	Bar
Universal-Cyclops	Thermold A	Sheet & Bar
Vanadium-Alloys	Vascojet 1000	Sheet & Bar



Twelve different taps . . .
were recommended by twelve different manufacturers to tap a specified thread in through holes in a specified material. The result was a change in buying procedure

Now we buy tapped holes . . . not taps

Tap inventories have been reduced more than 50%, scrap loss caused by inaccurate taps has been minimized, and geometric inspection of incoming taps has been eliminated. Over the past year an estimated $35,000 has been saved—simply by buying tapped holes instead of taps

CLARENCE MATHEWSON, senior standardization engineer,
EDWARD STUTZ, foreman, tool handling, Aeronautical Div
MINNEAPOLIS-HONEYWELL REGULATOR CO
MINNEAPOLIS, MINN

Just what would make a company scrap an established procurement policy? Faced with the problems of inconsistent taps and unfounded operator prejudice for certain brands of taps, Minneapolis-Honeywell's Aeronautical Division revised their entire system—and came up with some startling results: lower tap inventories, less scrap, and a reduction of 80% in setup time.

The Aeronautical Div turns out thousands of different parts in job-lot quantities. This means frequent changes in setups and very short runs. In addition, many of the holes tapped in the aircraft control parts machined in this division call for 4-40 or smaller threads, and all the threads must comply with military thread specifications. One oversize tapped hole is sufficient cause for rejection.

Until the tap procurement policy was changed last year, tapping problems were multiplied by inconsistent taps. Procurement policies required multiple sources for standard tools—but tests proved that taps ordered by conventional nomenclature from different makers cut quite differently. Results were unpredictable.

In addition, machine operators developed unfounded prejudices. Different operators would insist on entirely different types and makes of taps for the same jobs. And they were not consistent in their preferences—one day an operator would claim that one manufacturer's tap worked better than another's for a particular job; the next day someone else's taps might

Tapped holes . . . not taps . . .

get the nod. Tap selection by trial and error for each setup seemed, at the time, to be the only workable solution. The greater the available selection of different makes, styles and sizes, the better were the chances of finding a tap that would cut the specified threads in a given workpiece. But this resulted in much wasted time.

In an effort to obtain consistent taps, M-H asked twelve tap manufacturers to furnish samples of the taps they would recommend for 24 different combinations of requirements. Results differed considerably. In one case the twelve manufacturers submitted twelve different recommendations for the same job. It was concluded that the only way to obtain consistent taps was to specify the taps to be purchased in terms of the requirements of the hole they were to tap, and to insist that the taps produce acceptable holes.

Studies proved that the bulk of the tapping requirements could be met by taps for both through and blind holes in six materials—aluminum, brass, magnesium, plastic, mild steel and stainless steel. These taps must be procured in two series of thread specifications: (1) Class 2B, as listed in the Unified screw-thread system, and (2) pre-plate taps that will cut oversize threads in a part so that Class 2B thread specifications are met after a specified metal finish has been applied. The pre-plate taps are purchased in two series—Series I for aluminum and Series II for most other materials.

These requirements were studied by engineers for a number of tap manufacturers, and their recommendations were combined in the final specifications, which describe the required hole material to be tapped, method of marking the tap, and packaging instructions.

Specifications now in use cover taps ranging from 00-96 NS and 0-80 NF to ½-20 NF and ½-13 NC. To eliminate the problem of operators' preferences for taps supplied by one vendor or another, the specifications state that tap shanks are to be electro-etched with the diameter, pitch, tool number, and the manufacturers' coded symbol. This code is changed from time to time to prevent recognition. No other markings are permitted, and the taps must be packed in plain boxes. The same tool number is assigned to all taps purchased for a specific job, or group of jobs, and they are listed by this number—not by size—on all job specifications.

STANDARD TAP SPECIFICATIONS
(FOR PROCUREMENT)

THIS TAP MUST PRODUCE ACCEPTABLE CLASS 2B THREADS IN * THROUGH HOLES IN THE FOLLOWING MATERIALS:

1. BRASS 3. _____ 5. _____

2. _____ 4. _____ 6. _____

GENERAL DESCRIPTION - DIMENSIONS AND TOLERANCES MUST CONFORM WITH VALUES LISTED IN TABLE 304 (METAL CUTTING TOOL INSTITUTE STANDARD).

SPECIFIC DESCRIPTION - DIMENSIONS AND TOLERANCES. (IF NOT SPECIFIED WILL BE LEFT TO THE DISCRETION OF THE MANUFACTURER).

1. NO. OF FLUTES _____ 5. FLUTE TYPE _____

2. CUTTING CHAMFER _____ 6. POINT TYPE _____

3. PITCH DIA. BASIC + TO _____ 7. TAP MAT'L _____

4. SURFACE TREAT _____

MARKING - TAP SHANK TO BE ELECTRO-ETCHED WITH THE DIA.-PITCH, TOOL NUMBER, AND MANUFACTURER'S IDENTIFICATION AS SPECIFIED ON THE PURCHASE ORDER.

NO OTHER MARKING WILL BE PERMITTED. MARKING TO BE LOCATED AS SHOWN IN THE FOLLOWING EXAMPLE:

EXAMPLE: 6-32 MJ601M ---MFR'S IDENTIFICATION

PACKAGING - TAPS TO BE PACKAGED IN PLAIN UNIDENTIFIABLE BOXES. TWELVE PER BOX.

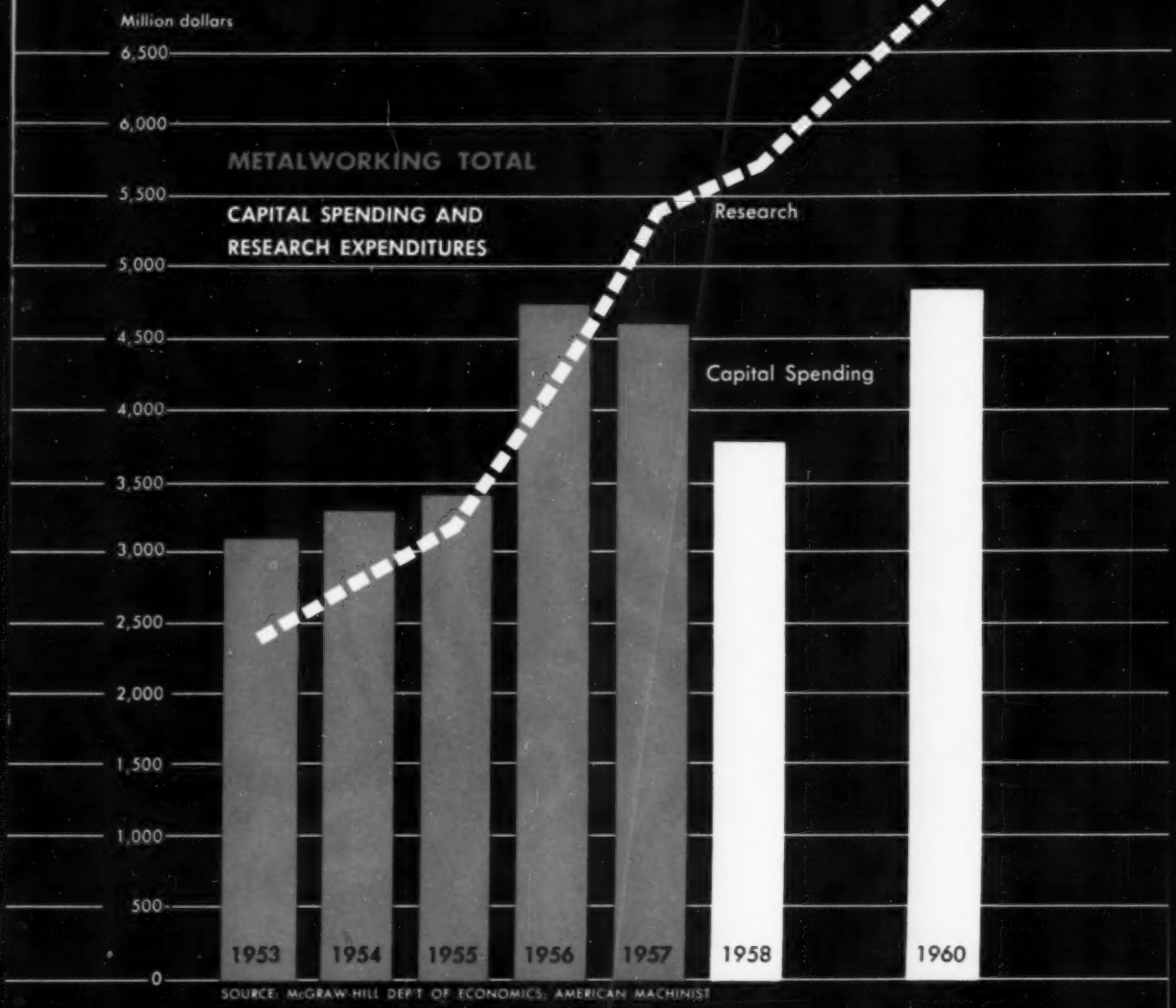
MARKING ON THE BOXES MUST CORRESPOND WITH THE MARKING ON THE TAPS. NO OTHER MARKING WILL BE PERMITTED.

* DEFINITIONS:
THROUGH HOLES - INFINITE CHIP CLEARANCE. SELDOM REQUIRES MORE THAN THREE DIAMETERS OF FULL THREAD.

This tap specification sheet . . .
which now accompanies each purchase order for taps, specifies the size of the hole to be tapped, the type of hole, and the material to be tapped. Only in special cases are tap design and size specified

AEC to Get Out of Gamma-Ray Testing Business

WASHINGTON—The Atomic Energy Commission has announced it will discontinue providing gamma ray irradiation service to private industry for detection of flaws in castings and forgings and other uses. AEC is discontinuing such service on grounds that private Cobalt 60 testing facilities in the United States are now adequate to meet industrial demands, and that they can do so at a reasonable price. According to AEC these organizations have facilities capable of handling more than 1000 curies of Cobalt 60: Admiral Corp, Chicago; Battelle Memorial Institute, Columbus; Budd Co's Nuclear Systems Division, Philadelphia; University of Denver; University of Florida; The Martin Co, Baltimore; Goodyear Tire & Rubber Co, Akron, Ohio; Inland Testing Laboratories, Morton, Grove, Ill; University of Louisville; University of Michigan, University of Minnesota; Radiation Applications Inc, Long Island City, N Y; Rensselaer Polytechnic Institute, Troy, N Y; Southern Research Institute, Birmingham; Southwest Research Institute, San Antonio; and Stanford Research Institute, Menlo Park, Calif. Details as to the accommodations of these facilities are available from the Office of Industrial Development, Atomic Energy Commission, Washington 25, D. C.



SOURCE: McGRAW-HILL DEPT OF ECONOMICS; AMERICAN MACHINIST

Where METALWORKING is heading

Metalworking has grown vigorously and steadily during the 1950's. It will be still bigger by 1960. Here are never-before-published figures on capacity, production, research, and capital spending in major metalworking industries.

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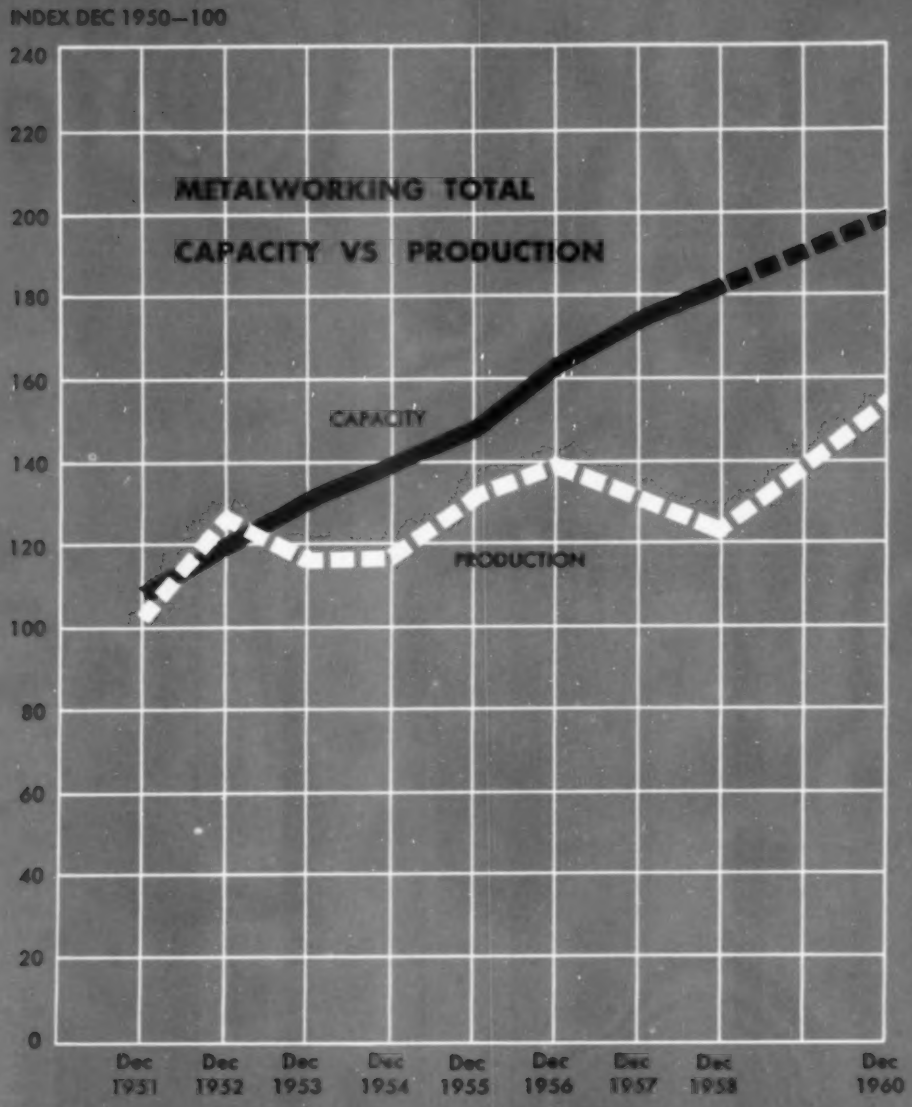

SOURCE: McGRAW-HILL DEPT. OF ECONOMICS, AMERICAN MACHINIST

Where METALWORKING is heading . . .

Metalworking to continue to grow faster than industry as a whole

Metalworking has had a remarkable record of growth in the 1950's. And by the end of the decade in 1960, there will have been further expansion from where Metalworking is today. The growth, in fact, is outstripping that of American industry as a whole. This sterling performance of the metalworking industries has been going on since the termination of World War II. And the end is not in sight.

Since 1950, the nation's capacity for turning out metal goods of all kinds has increased more than 75%. The Korean defense program acted as a spur, to be sure, but the tremendous demand that developed for both capital goods and consumer items the past five years gave added impetus to investment in ever-growing facilities. Though there seems to be too much capacity in certain areas just at the moment, this situation is regarded as temporary. Metalworking today has

not stopped expanding. It has merely slowed down. And by the end of 1960 it is estimated that Metalworking's capacity to produce goods will be 15% greater than it is now.

Metalworking's sharp upward course in plant capacity, though spectacular, has been overshadowed lately by its outpouring of money for research and development. The metalworking industries have been doing the lion's share of U S product research and will continue to do so. Even if production is faltering at present, the outlays for research are just as great as planned, and perhaps greater. In 1955, the amount spent for research in Metalworking ran to $2.8 billion. The next year the dollar total rose to $3.7 billion and last year it spurted to $4.7 billion. In 1960 it promises to get up to $6.3 billion.

Most amazing of all, expenditures for research and development have recently far outstripped Metalworking's investment in new plant and equipment. Five years ago research spending was about 80% of the dollar total for new plant and equipment. Last year the research budget surpassed that for new plant and equipment. This year it will be half again as much. If current predictions are borne out, in 1960 research still will get more of Metalworking's dollars than will new plant and equipment.

This surprising trend is all to the good. New materials and new production technology are being developed at a faster rate than ever before. Manufacturers are hard at it to originate and perfect new products as competition increases between one company and another and between one industry and another. Products and processes are being obsoleted faster than ever before in history. The old are being pushed into oblivion by the new. As the five-to-seven-year cycle of inception-to-production of new products gets working, more and more new metal products will be coming onto the market. And metalworking companies will have to tool for their production. That will mean hefty outlays for new plant and equipment in the years ahead.

Capital spending for new plant and equipment in Metalworking has been enormous during the 1950's. In the past five years more than $19 billion has gone into more and better plants and equipment. That is an all-time record. No wonder that capital expenditures this year will show a decline. But even so they will be about 82% of the 1957 figure. Within the next two years the money paid out for new plant and equipment will have resumed its upward course. Conservative estimates are that 1960 spending will be around 30% bigger than this year.

Production of goods by the metalworking industries was one-third higher at the end of 1957 than in 1950. It will be down a little in physical volume this year (though it probably will be about the same in dollars). But it is expected to be back up by 1960.

What's happened up to now and what will happen during the remainder of the 1950's in the various major segments of Metalworking is spelled out on the next nine pages.

METALWORKING TOTAL

	Capital Spending Millions	Research Expend. Millions
1953	3,066	2,409.4
1954	3,249	2,764.0
1955	3,376	3,183.3
1956	4,697	4,302.7
1957	4,566	5,366.7
1958	3,745	5,721.6
1960	4,849	6,959.4

METALWORKING TOTAL

Dec 1950—100

	Capacity	Production
Dec 1951	110	104
" 1952	123	127
" 1953	132	118
" 1954	140	119
" 1955	151	132
" 1956	165	140
" 1957	177	132
" 1958	186	127
" 1960	200	154

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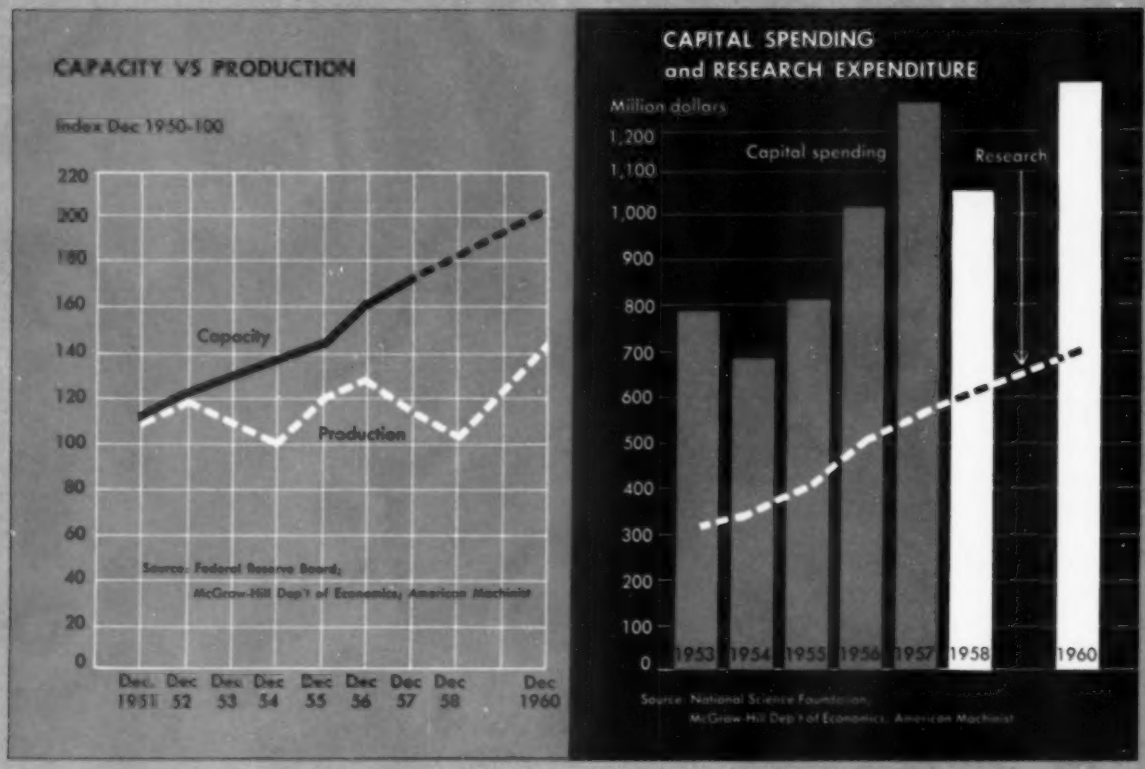
Where METALWORKING is heading . . .



MACHINERY, EXCEPT ELECTRICAL

The machinery industry should attain a new peacetime high mark in 1960 as needs rise for industrial machinery of all kinds, for farm machinery and for production equipment. Operations were at about 70% of capacity in 1957. They will be somewhat lower this year. But it seems doubtful that the decline will be greater than 10%. Capital spending is heading down in 1958; but it is expected to rebound to a new high point by 1960. There has been a steady gain in the outlay for research and development. In 1957 the total was $577 million. This year the amount is likely to grow to around $620 million. It is a reasonable expectation that the money spent on research and development will go up to $700 million or more in 1960.

FARM MACHINERY

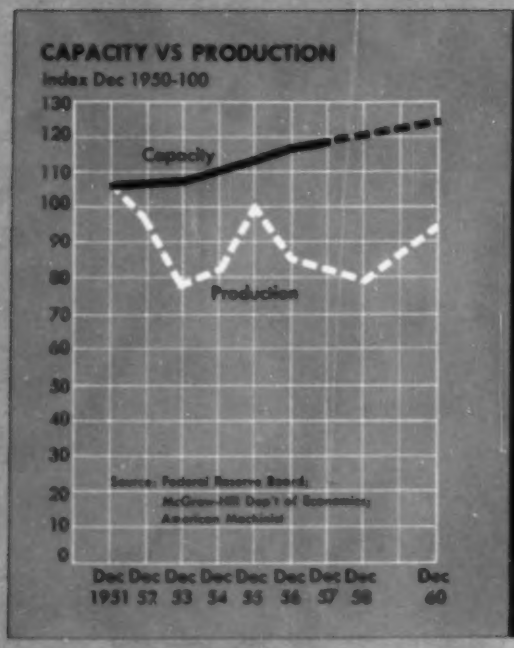
The production capacity of the agricultural implement industry has increased less than that of any other metalworking industry in the period between 1950 and 1958. The present trend, however, is slightly up, with the industry ending this year with more facilities than at the beginning. The annual operating rates within this segment of Metalworking have been relatively poor, partly because of serious shutdowns caused by strikes in several of the years. Contrasted with the marked growth in operations in many metalworking lines, the high point in production of farm machinery in the 1950-1957 period was back at the end of 1951, more than six years ago. Output this year probably will drop about 5%.

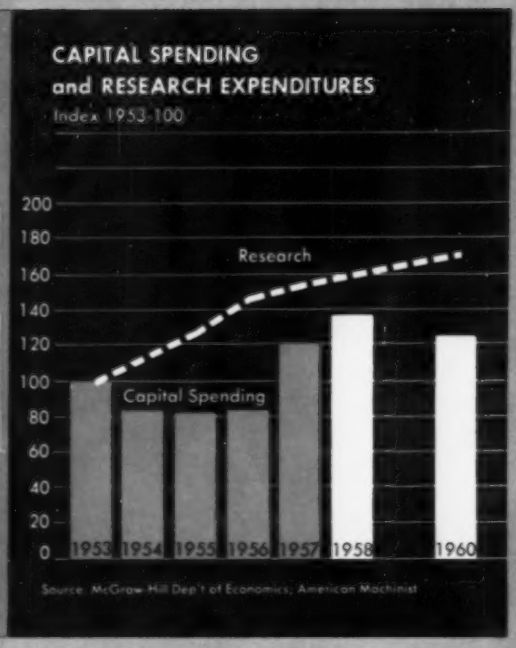
Capital expenditures have failed to follow the course in other metalworking industries. They made a mediocre or poor showing in 1954, 1955 and 1956. They did much better in 1957 and will be still higher this year. Research and development spending will be 60% higher this year than back in 1953. They are expected to be 75% bigger in 1960 than in 1953.

OTHER INDUSTRIAL MACHINERY

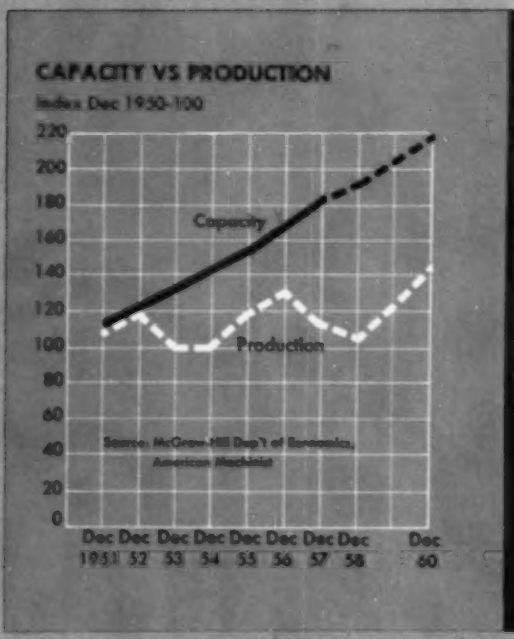
Makers of other industrial machinery (construction and mining machinery, engines and turbines, general industrial machinery and special industrial machinery) say that they will have at the end of 1958 almost double the capacity that they had in 1950. Production was down moderately at the end of 1957 compared with the year previous. It will be off around 8% more when 1958 runs out. That means that the operating rate will continue to drop. But output should be up sharply by 1960. Research and development outlay this year will be 2¼ times the 1953 total.

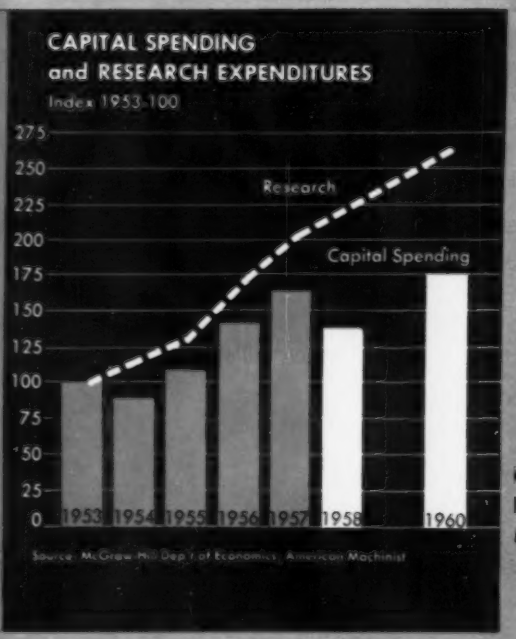
CAPACITY VS PRODUCTION
CAPITAL SPENDING



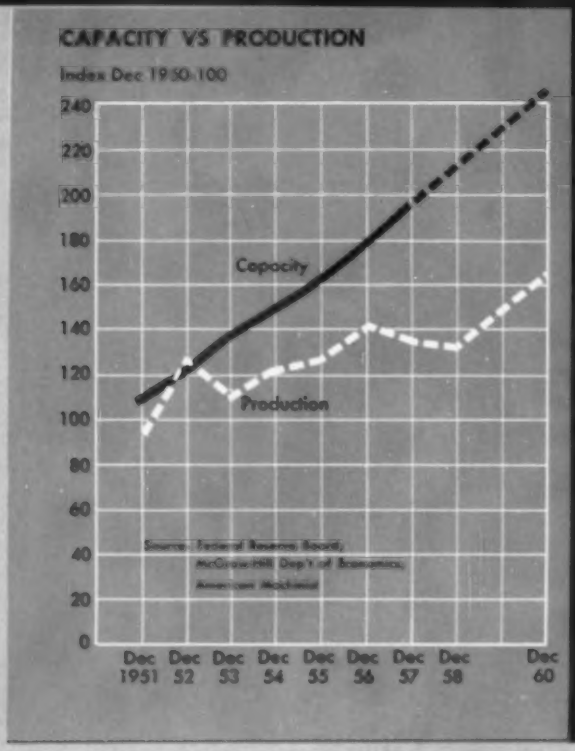


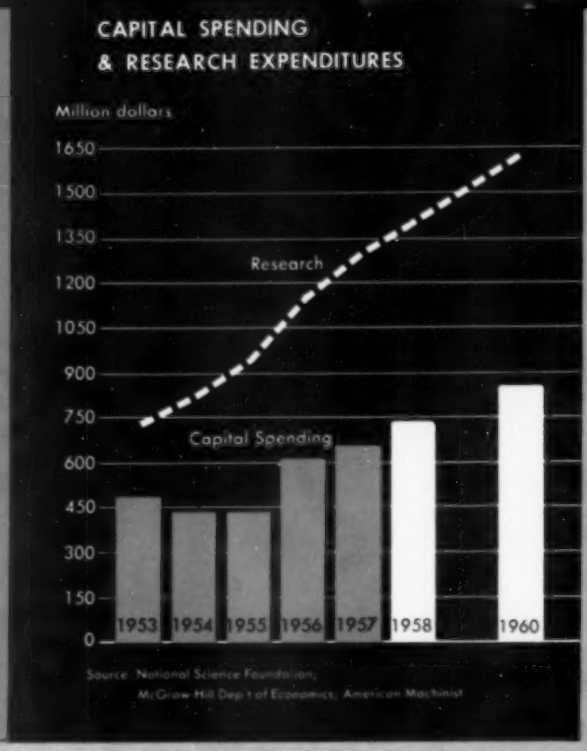
FARM MACHINERY





OTHER INDUSTRIAL MACHINERY





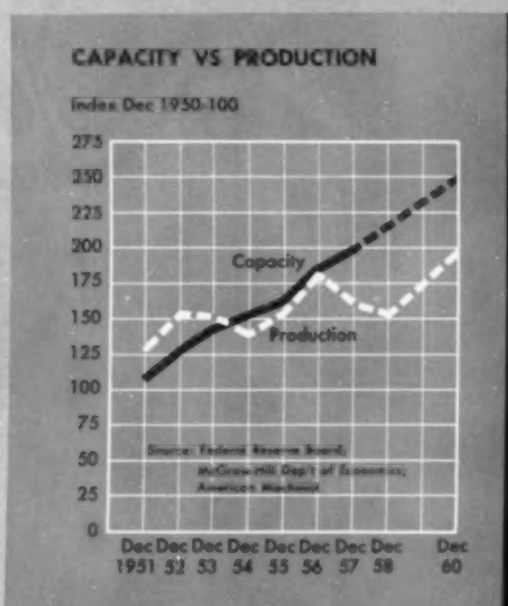
ELECTRICAL MACHINERY

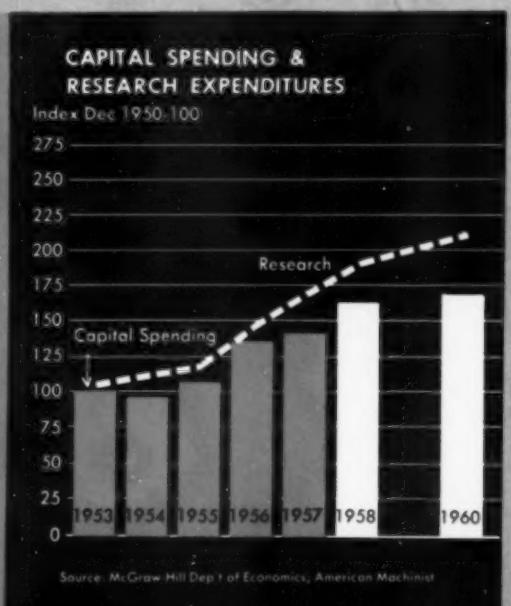
The electrical machinery industry, embracing heavy electrical apparatus as well as household appliances and radio and TV sets, has doubled its manufacturing facilities since 1950. Research expenditures too have been steadily rising through the years. In 1958 they will total $1.4 billion, an increase of 8% over the previous year. It is estimated that they will go up further to $1.6 billion by 1960. Expenditures for new plant and equipment are not following the 1958 pattern for most metalworking industries. They are heading up instead of down. The dollar total this year will be 13% higher than in 1957. By 1960 the annual dollar outlay for capital equipment should be $850 million. The operating rate, which this year is likely to be at a lower level than any time since 1950, should pick up in a year or two as population trends, family formations, housing and other factors come into play.

ELECTRICAL APPARATUS

The heavy electrical apparatus industry has been doing better than almost any other segment of the metalwork-

ELECTRICAL APPARATUS



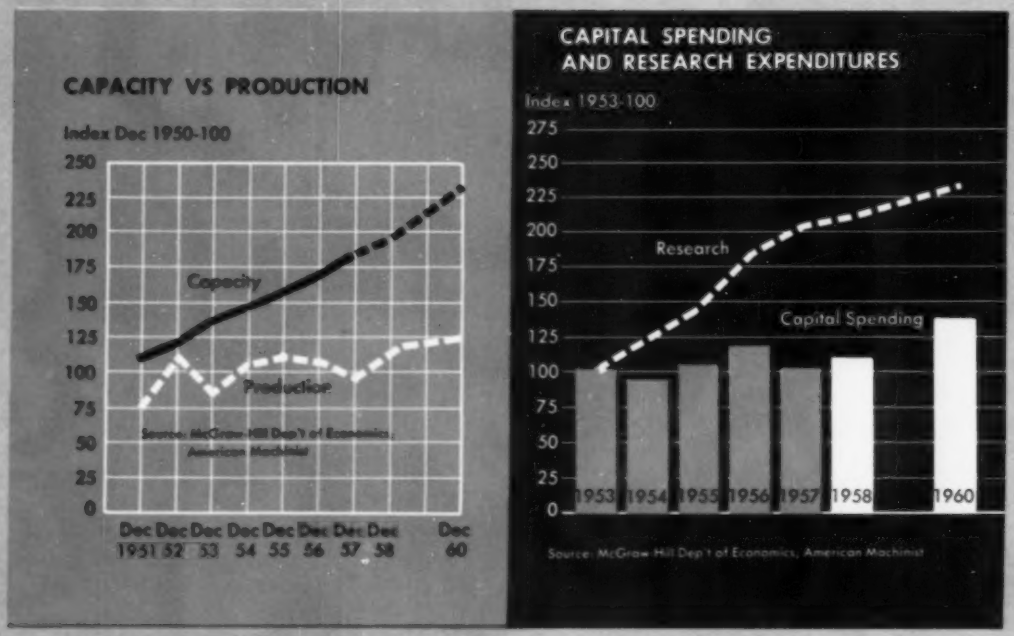


Where METALWORKING is heading . . .

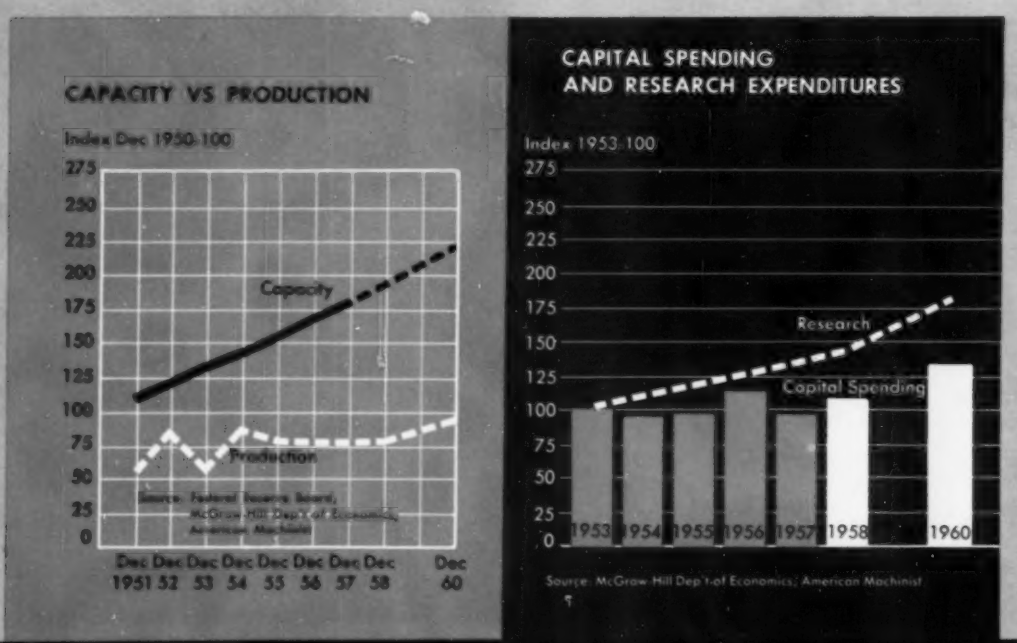
ing industries for a long time. Only at the end of 1957 did the operating rate drop below 90%. During 1958 production will decline slightly and capacity will grow, thus pulling down the operating rate. With the exception of 1954, capital spending rose in every year from 1953 to 1957. It will be up considerably this year over last. The dollar volume of research and development in 1958 will be about double the 1953 total. Plans for the years ahead insure rapid growth in research and development.

APPLIANCES, RADIO and TELEVISION

Capacity for making appliances, radios and television sets will be double the 1950 total by the end of this year. Meanwhile relatively poor consumer demand has had a dampening effect upon output, which consistently has stayed below the peak performance of prior years. The operating rate of the appliance people averaged only 65% between 1953 and 1957; in the radio and TV set industry, it was not much more than 50%. Research outlays by appliance makers have doubled since 1953, the money being spent on new products and on new ways of producing them. On the other hand, capital investment in new plant and equipment held at about the same level between 1953 and 1957. Radio and TV set manufacturers also spent about the same amount of money year by year for new plant and equipment over the past five years. Expenditures for research, which have not been big, are likely to jump sharply the next two years.

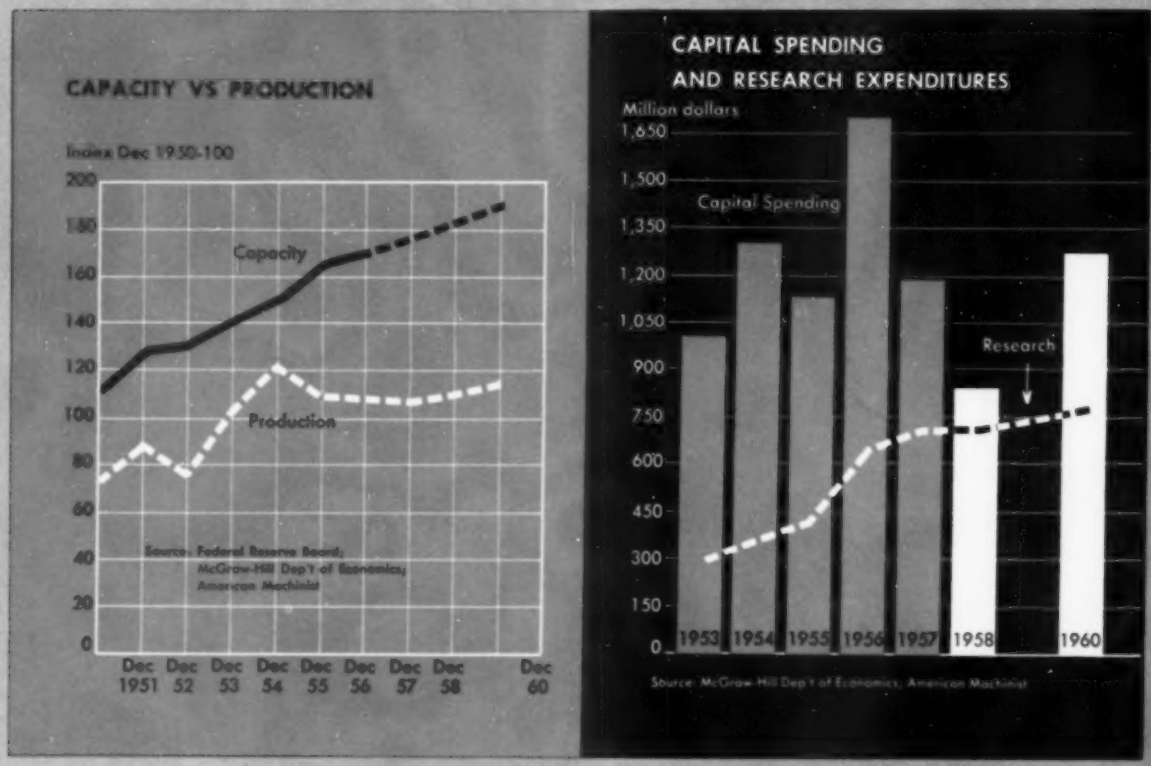


APPLIANCES



RADIO and TELEVISION

Where METALWORKING is heading . . .



AUTOS, TRUCKS AND PARTS

Outpouring of funds for research and development in the automobile, truck and parts industry is running 2½ times the level of five years ago. Last year it amounted to $700 million. It will be about the same sum this year. Capital expenditures, on the other hand, will be the lowest this year since 1950. One should not forget, however, that money spent for new plant and equipment in the years 1953 to 1957 inclusive averaged more than $1¼ billion a year, sparking expansion in many other branches of Metalworking. It is believed that capital outlays by the automotive people will be back at a top rate again by 1960.

The capacity of the automobile industry (cars, trucks and parts) grew 70% the past seven years. A small increase is scheduled this year. Meanwhile the production performance of the industry has not begun to come up to the expansion in facilities. It probably will be 1960 before another 7-million-passenger car year is recorded.

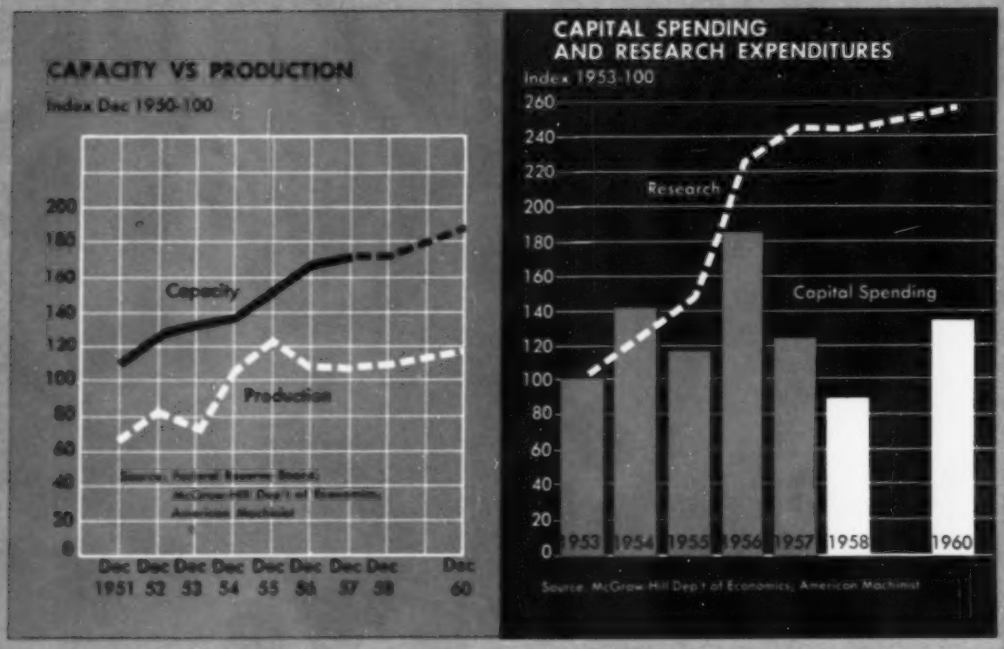
AUTOS and TRUCKS

Few industries have increased their production facilities as much as the automobile industry the past five years. Car and truck manufacturing capacity will be 75% greater at the end of 1958 than at the end of 1953. This abrupt rise is believed to have set a new record for the industry. Much of the gain has come in new engine capacity though it is by no means confined to that. Capital spending by the automobile people touched a new peak in 1956, when the dollar total was almost double (84% to be exact) the 1953 average. Spending dropped sharply (one-third) last year. It is estimated to go down about the same percentage this year. Research and development spending, on the other hand, is up substantially. By 1960 capital spending should be about two-thirds higher than in 1958.

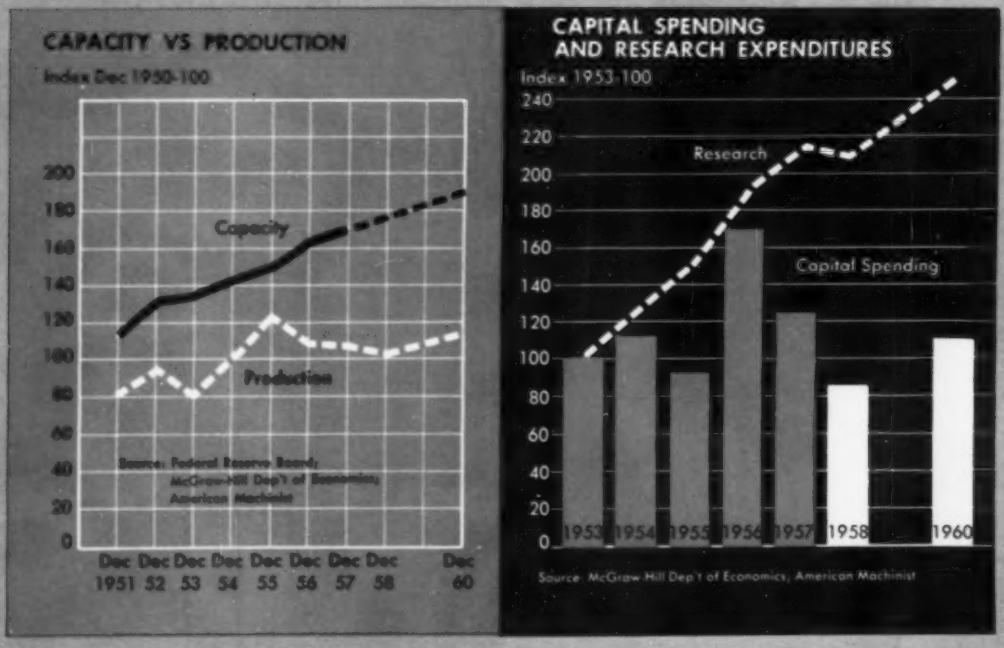
AUTO PARTS

Research and development outlays by the automobile parts companies, at a time when the parts business has shown little vigor, suggest that much work is being done in an effort to diversify products. While the total dollar spending for this purpose is fairly large, it will go down a bit this year. So far as spending for new plant and equipment is concerned, the trend in the parts industry usually follows that of automobile makers. The automobile parts industry is currently operating at less than 70% of capacity. The outlook is for a further decline in production, with a small amount of new capacity being added. But the long-term outlook is considered good.

CAPACITY VS PRODUCTION
CAPITAL SPENDING AND RESEARCH EXPENDITURES

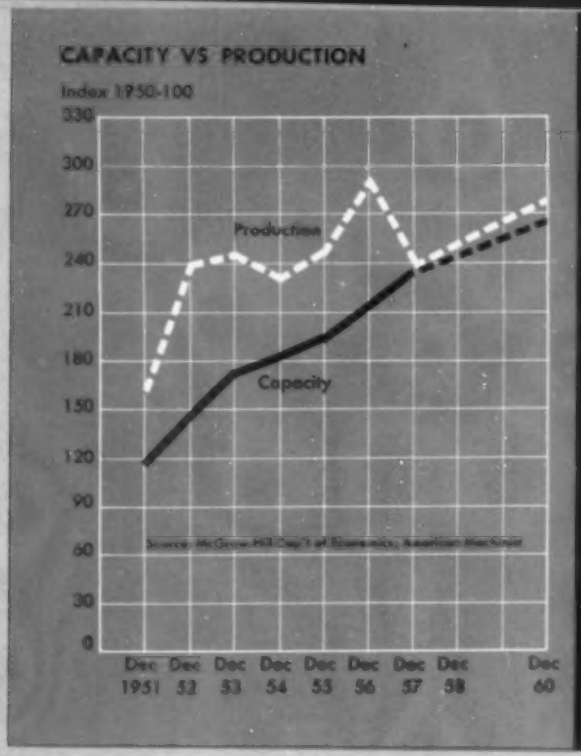


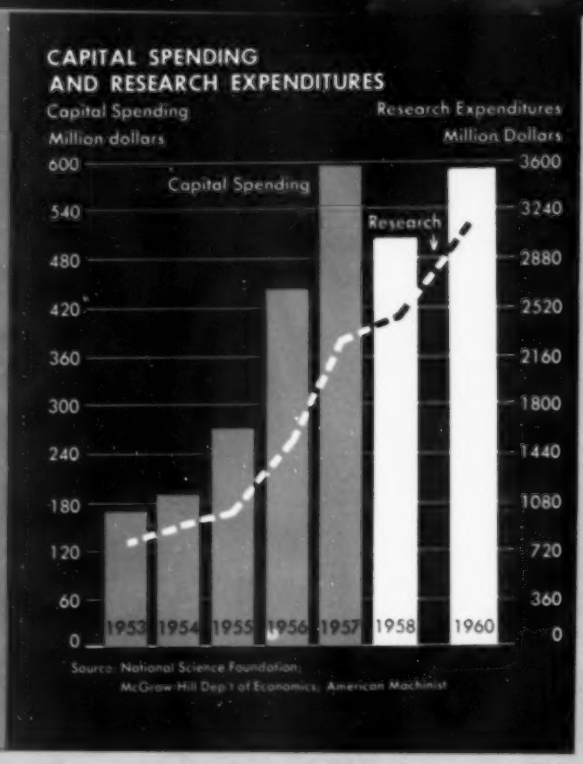
AUTOS AND TRUCKS



AUTO PARTS

Where METALWORKING is heading . . .



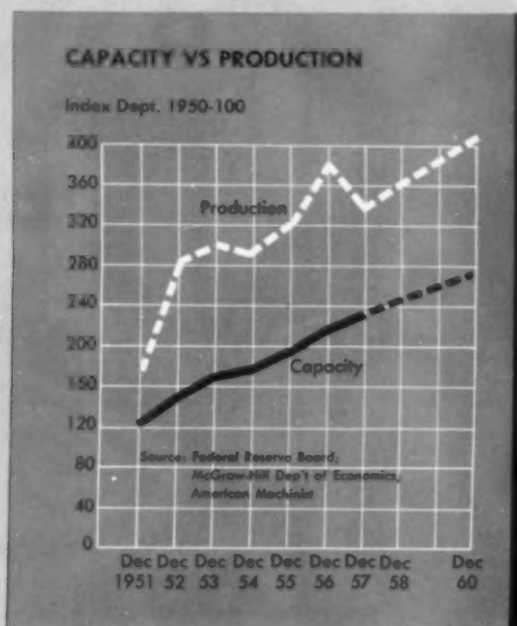


TRANSPORTATION EQUIPMENT (other than autos)

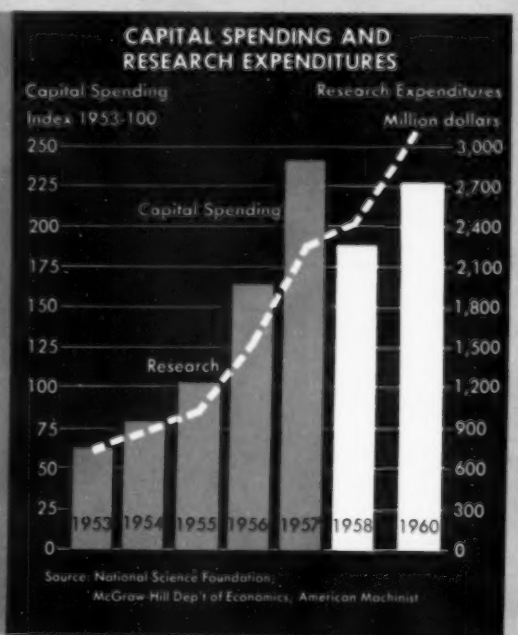
The production capacity of the transportation equipment industry (other than automobiles) has been expanded 150% since 1950, thanks to the growth in the aircraft industry, which is closely tied to national defense requirements. Capital spending in 1957 was 3½ times the dollar total for that purpose five years ago. Even more sensational, and again the aircraft industry is the main spur, research and development work added up to $2.5 billion last year. That incidentally was five times the investment made in new plant and equipment. A large chunk of research, of course, is paid for by the federal government. Within the next two years the outlay for research and development is expected to top $3 billion annually.

AIRCRAFT

The aircraft industry has enlarged its capacity 2½ times above the 1950 mark. Yet output, which was at a low point in 1950, is now 3½ times what it was then. This does not mean that there is a shortage of facilities, however. Excess capacity, in fact, has been building up for quite a while.



AIRCRAFT



OTHER METAL WORKING

CAPITAL SPENDING

Where METALWORKING is heading . . .

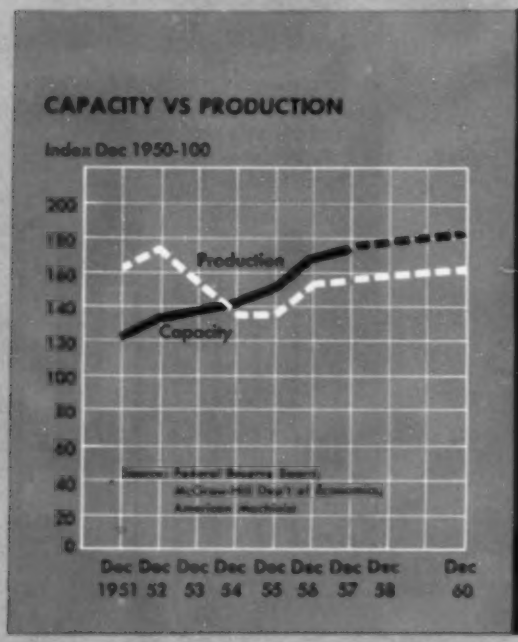
Capital investment for 1958 may turn out to be bigger than earlier anticipated, because of the new missiles and aircraft programs. Research and development outlays are expected to run to about $2.4 billion this year. They will be in excess of $3 billion in 1960.

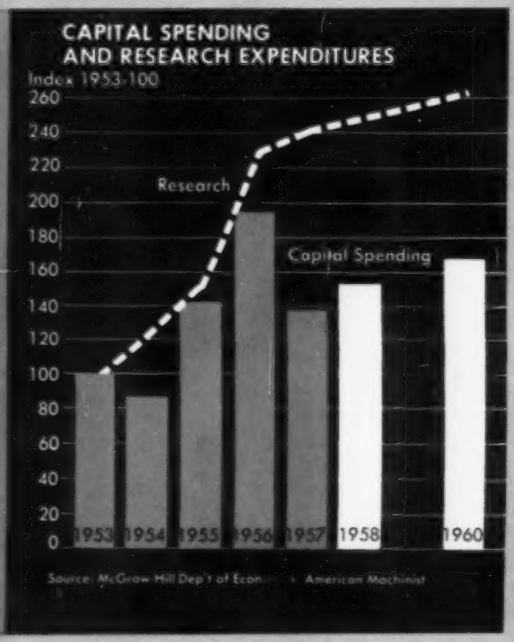
SHIPBUILDING

Shipbuilders have increased their facilities more than 50% since the end of 1950. With a sizable backlog of orders, the shipbuilding industry is operating at about 85% of capacity. Construction of new ships will continue high the next few years. That is why a further gain in production facilities is a reasonable expectation. Capital outlays hit a peak in 1956, almost doubling the 1953 figure. Last year the amount shrank. But in 1958 shipbuilding is one of the few metalworking industries which will show a gain in dollars put into new plant and equipment. Research and development spending is running about 2½ times higher than in 1953.

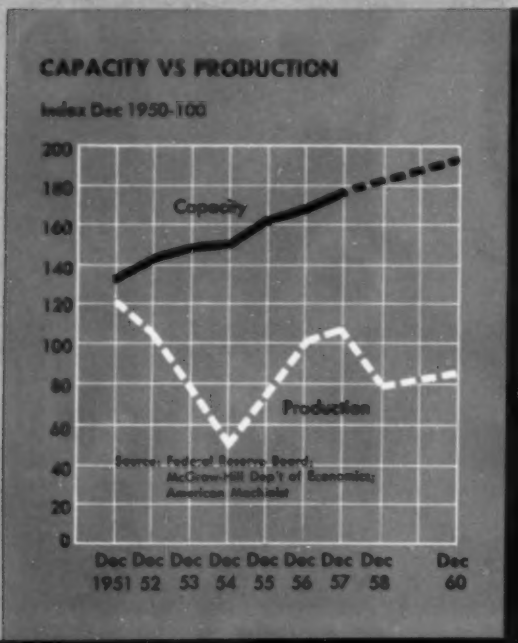
RAILROAD EQUIPMENT

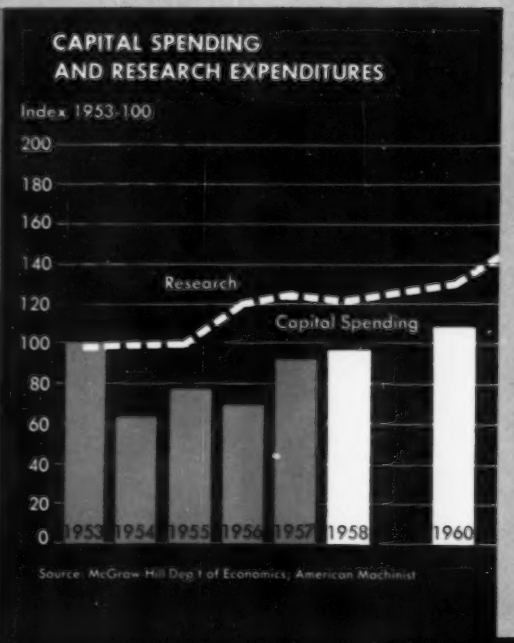
Railroad equipment people will have two-thirds more production capacity at the end of this year than at the beginning of the 1950's. Much of the enlargement can be chalked up to the urge to diversify, because manufacturers in this industry now have many new product lines. In 1957, output of railroad equipment totaled more than 100,000 freight cars. It was one of the biggest years in history. Even so, operations are currently at less than 60% and are expected to dip further. Capital spending got to a peak in 1953 and has not been that high since then. The gain in research and development spending since 1953 is the smallest of all segments in Metalworking.





SHIPBUILDING



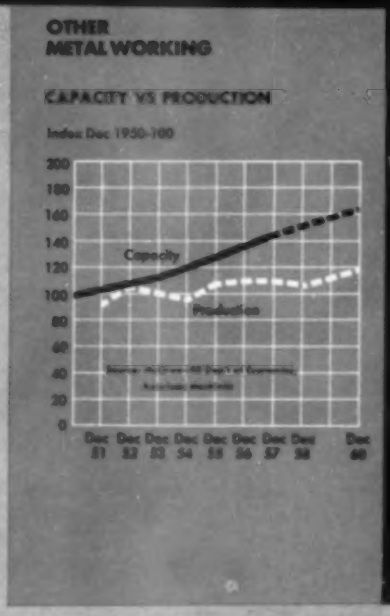


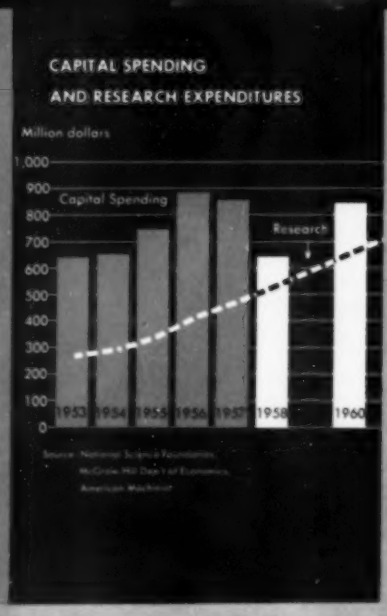
RAILROAD EQUIPMENT

Where METALWORKING is heading . . .

OTHER METALWORKING

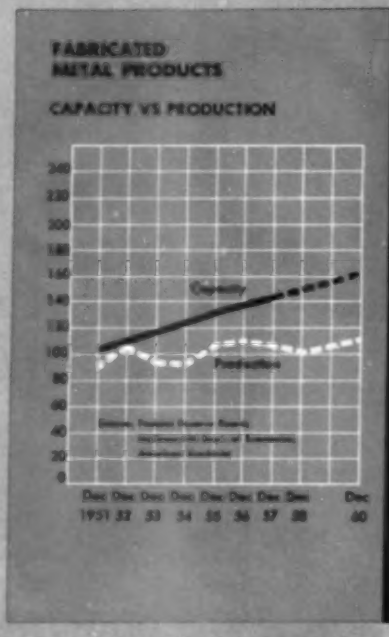
Manufacturers in the classification of "Other Metalworking" have added about 50% to their plant capacity since 1950. Output currently is about 10% better than it was in 1950. Capital spending this year is expected to amount to the same dollar total as in 1953. This represents a decline of some 30% from last year's level, which was only slightly below the 1956 figure. Research and development outlays have risen every year since 1953 and this year will be a whopping $535 million.

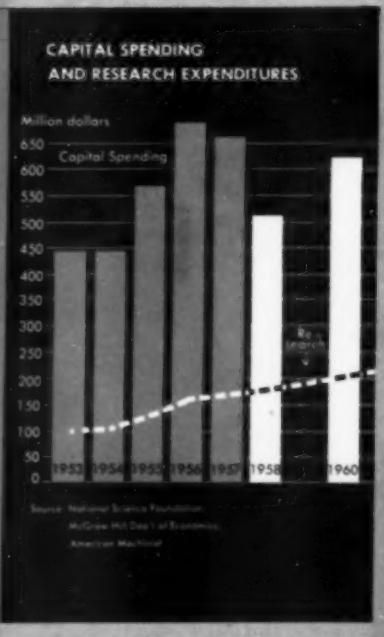




FABRICATED METAL PRODUCTS

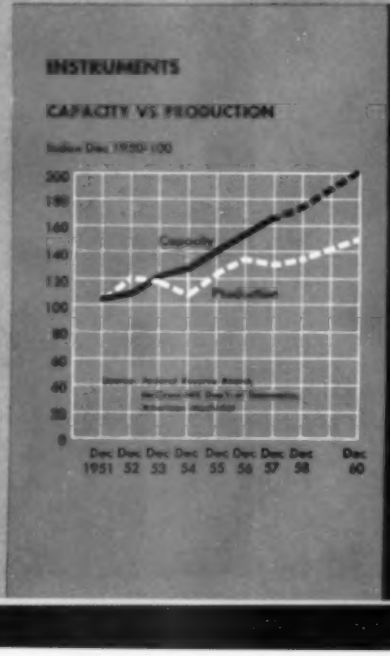
The fabricated metal products industry added only 40% to its factory facilities from the end of 1950 through 1957. Production today is not much more than 7% above the 1950 point. In the year ahead the operating rate is almost sure to drop, because output promises to go down and capacity to go up. In the five years 1953-1957, capital spending was around $3 billion. But it will be off 23% this year. Happily, it is destined to gain substantially by 1960. Research and development outlay was $174 million in 1957 and will rise to $210 million in 1960.

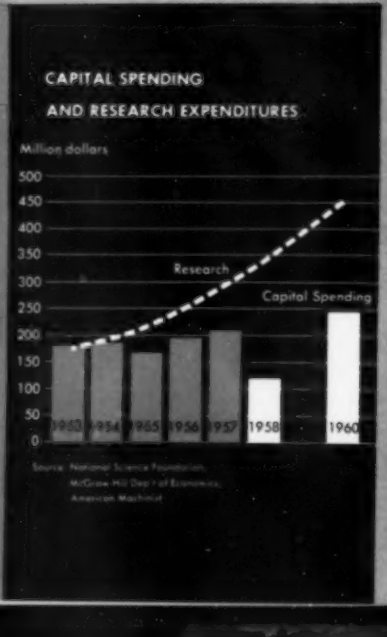


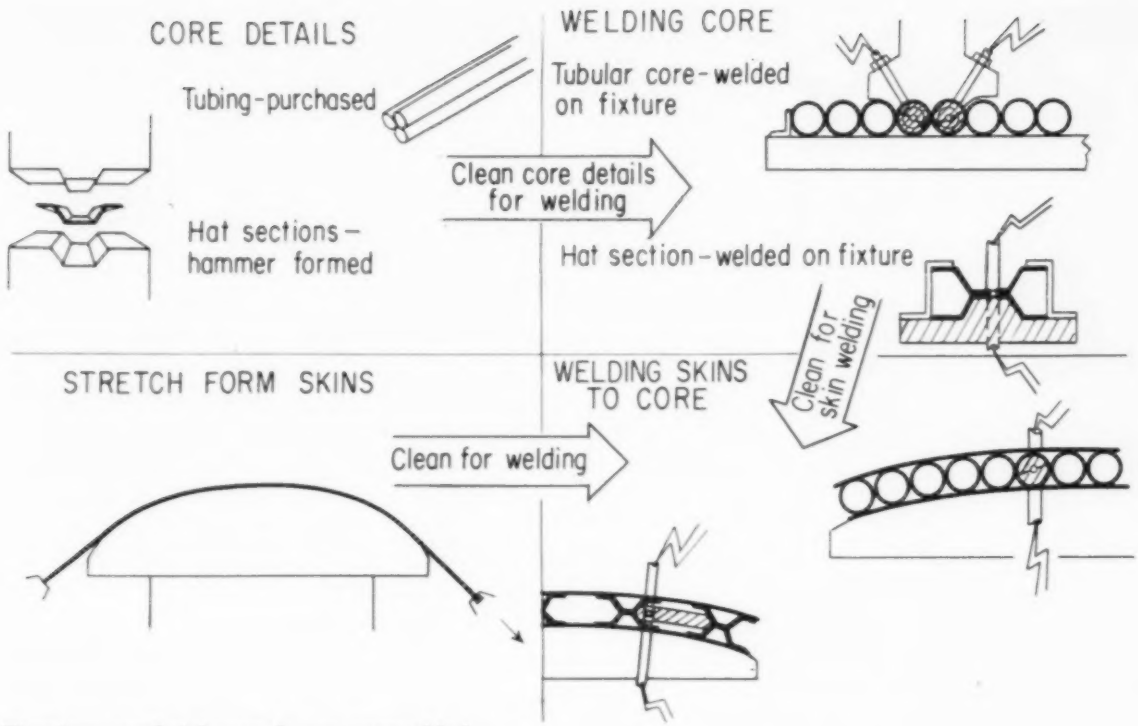


INSTRUMENTS

The production capacity of the instrument industry went up 70% between 1950 and 1957. Actual output has increased about half that much. Capital spending is plummeting this year to about half of what it has been. But it is a fair estimate to say that spending in 1960 will be higher by quite a margin than in record-breaking 1957. Research expenditures this year will be double 1953's and will continue to climb.







Titanium sandwich panels are spotwelded . . .
with expanding mandrels. Cores are built up from tubes or hat sections before being welded to formed skin. Other designs call for continuous-sheet corrugated shapes

Spotwelding titanium is practical

Titanium has the reputation of being hard to work with, but Boeing engineers in their search for production techniques have learned how to produce spotwelds of consistently high quality

W R GAIN, general supervisor, welding
D E WAITE, manufacturing research engineer
BOEING AIRPLANE CO, SEATTLE, WASH

As recently as December 1956, engineers at Boeing Airplane Co had little information on the spotwelding characteristics of 6Al-4V titanium. In fact, some reports indicated that the material could not be spotwelded with commercially available equipment. Aircraft designers, however, were anxious to make use of its outstanding strength-to-weight properties, especially in high-temperture applications. As a result, research was undertaken to determine the proper procedures and tooling requirements for spotwelding this material in production.

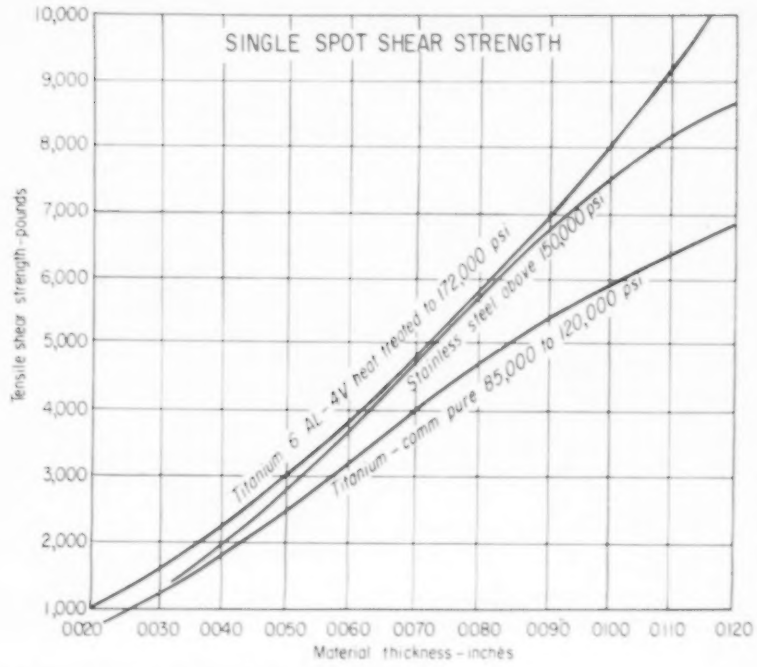
The first goal was to produce spotwelds with mechanical properties compatible with those of the base metal. The ultimate tensile strength of 6Al-4V titanium is in excess of 170,000 psi. Therefore, the single-spot shear strength had to be equal to or greater than the shear strength for steel alloys in the same ultimate tensile-strength range. The success of this effort is shown in the accompanying chart of comparative shear strengths.

In the course of the experimental work, tests of the material in various heat-treated conditions showed that the post-weld thermal treatment did not improve the mechanical characteristics of the welds. All further investigations were confined to spotwelds made on material in the solution-heat-treated and fully aged condition.

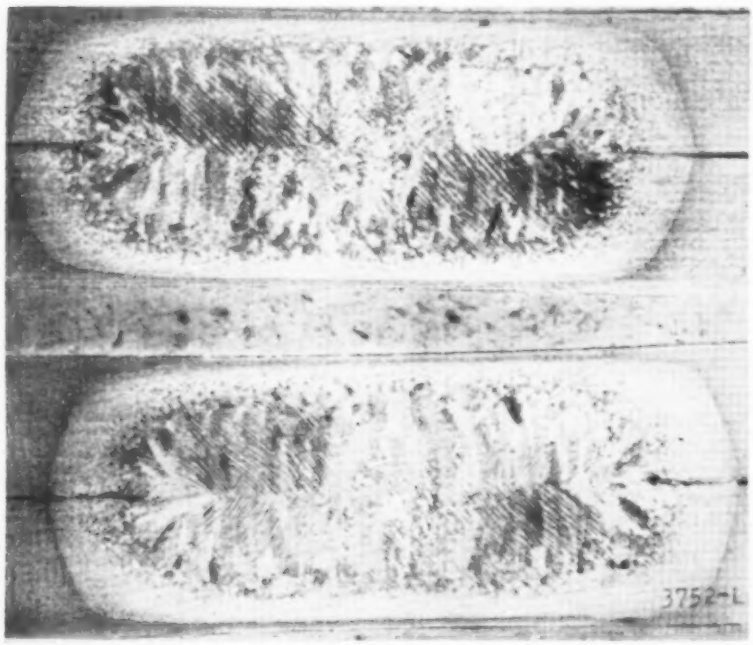
PHYSICAL CHARACTERISTICS

Titanium differs from most of the usual airframe materials in that it has a high thermal resistance and also has a relatively high electrical conductivity. Both of these characteristics are higher than those of 18-8 corrosion-resistant steels. Their effect is to retain heat in the weld zone because of the slow lateral heat transfer through the parent metal. The retained heat, of course, causes deep penetration of the fused zone.

For this reason, and to preclude metal expulsion and minimize forging out—and also to provide a reasonable tension-to-shear-strength ratio—the welding procedure calls for a low current and



Comparison of spotweld strength . . .
in 6Al-4V titanium, in stainless steel, and in commercially pure titanium. Values for 6Al-4V are average strengths of standard material thicknesses in equal gage combinations from 0.025 to 0.130 in.



Uniform weld nuggets are produced . . .
in 0.080-in.-thick titanium when spotwelded on a single-phase ac machine with a constant electrode force of 2800 lb, 20 cycles of time, and a 60% heat input from a 100 kva transformer. Single-spot shear strength is over 5600 lb, and tension pull-out is 1800 lb

a relatively long weld time. This technique consistently produced the best results and significantly improved the ratio of tension strength to shear strength. While good results are obtained with single-phase AC machines, 3-phase frequency converter equipment is also satisfactory. Tests have indicated that, when multiple impulses are required on 3-phase equipment, the cool time between impulses must be as short as possible.

Consistency is exceptionally good in tensile shear strength, tension pull-out strength, size and shape of spotweld nugget, and in penetration. No problems have been encountered with internal defects such as cracking or porosity, nor has there been any problem in balancing the heat to achieve the desired weld penetration.

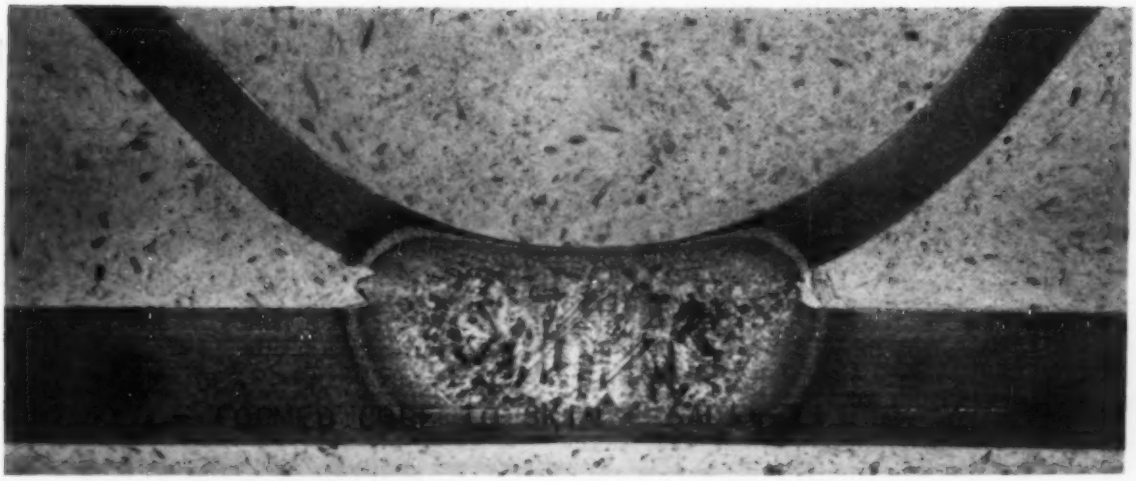
CONTAMINATION

Surface contamination picked up during heat treating remains a primary problem. This occurs most frequently as surface oxygen diffusion. In the case of a spotweld in material with oxygen diffused to a depth of 0.005 in., the single-spot shear strength was reduced more than 1000 lb, and the tension-to-shear ratio dropped to 0.16. Although diffused oxygen is currently being removed in a hydrofluoric nitric-acid pickle, efforts are being made at present to eliminate surface contamination during heat treatment.

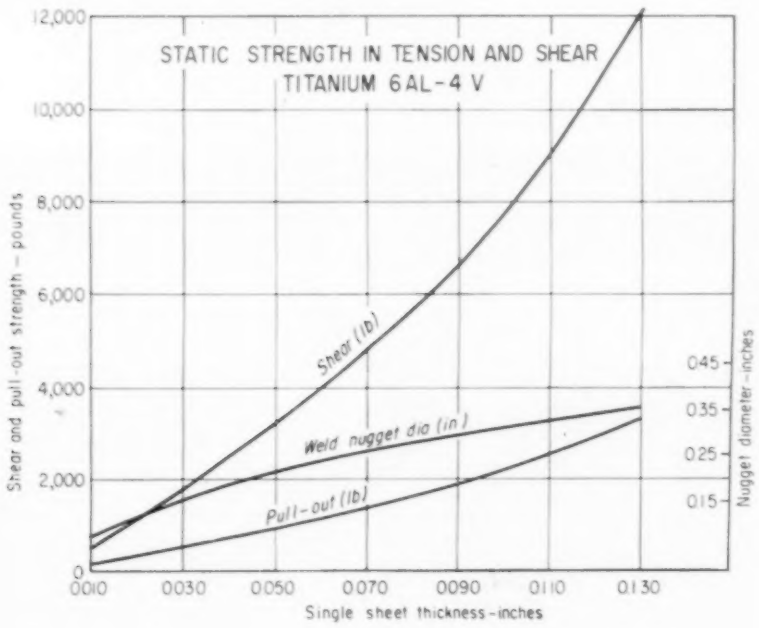
APPLICATION: sandwiches

In the determination of procedures and tooling requirements for spotwelding 6Al-4V on a production scale, interest was centered on fabricating sandwiches consisting of two relatively thin face sheets separated by unidirectional cores of various configurations. These include tubing, back-to-back sections, single hat sections, and various continuous-sheet corrugated shapes such as the sawtooth and sine-wave configurations.

In the fabrication of some of these unidirectional core sandwich panels, the edge margin is reduced to zero. For example, cores made of tubes, sawtooth, and sine-wave configurations make contact with



Titanium (6A1-4V) extrudes into gap . . .
on each side of point of tangency when spotwelded. When spotwelds in two pieces of 0.080-in. material are compared with those in four pieces of 0.040-in. stock (0.160-in.), no significant difference is found in the size or shape of the weld or in the dendritic structure across the interfaces



Shear and pull-out strengths . . .
with corresponding nugget diameters for spotwelds in 6Al-4V titanium

the face sheet only along the line of tangency. Even in hat section cores, the edge margins are considerably less than normal to reduce weight and to provide adequate stability of the face sheets.

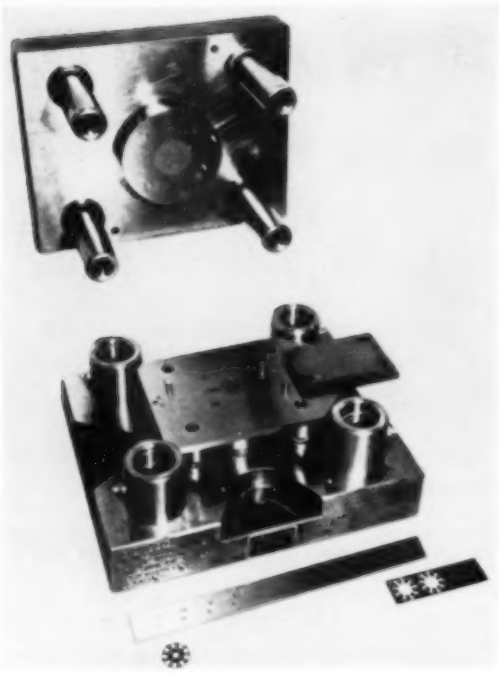
These reduced edge margins are possible only because of a fortunate characteristic of the alloy when it is being spotwelded. It can extrude into the gaps between skins and core without expulsion and without causing flaws in the weld nugget structure. Nobody knows exactly why the material behaves this way, but the effect is beneficial.

One of the results of the experimental work is a 3 x 10-ft sandwich panel with a core made of tubing. The tubes were first welded to each other to create an integrated core. During this operation, expandable electrodes were inserted in the tubes being welded to provide a path for the welding current. The electrodes operate hydraulically and are synchronized with the welding machine. Then the panel was completed by welding the face sheets over the core, using a similar expanding mandrel.

4 advanced carbide dies

When product accuracy requirements grow tighter, press-room labor and assembly operations must be reduced. To meet such needs, Oberg Mfg. Co., Tarentum, Pa., contract die shop, designs and builds carbide dies that incorporate advanced ideas

RUPERT LE GRAND, senior associate editor



Compound die holds concentricity...

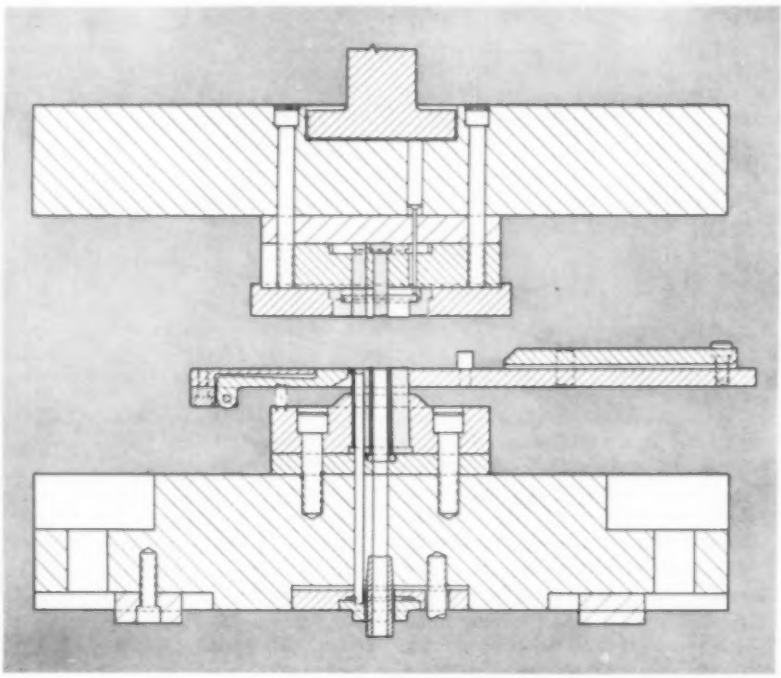
Synchro laminations must have center hole and OD concentric within 0.0005 in. total indicator reading, be flat and strain free, and have burr well within 10% of material thickness. These requirements are met with a compound die in which the cutting edges are solid carbide.

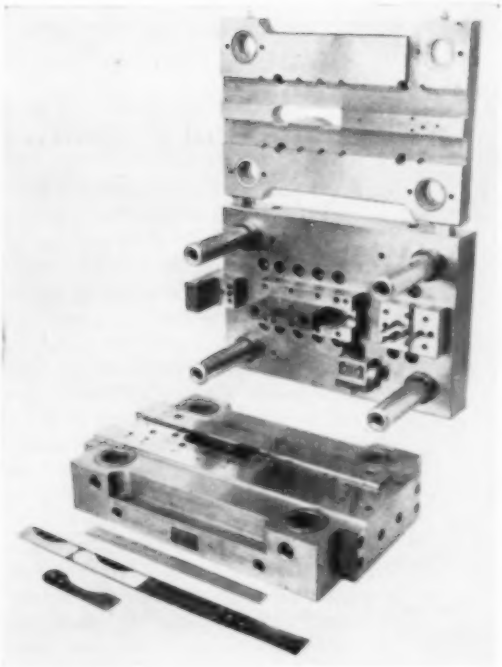
The part has nine slots, the web between the slots being 9/32 in. wide. Radius at bottom of the slots is only 0.050 in.

Segmental construction is used for the cutting members in the upper and lower parts of the die.

The upper part consists of the blanking die and the punches to cut these slots and center hole. The lower part contains the blanking punch and the die cavities for the slots and center hole.

In operation, the strip is fed from right to left. After the upper member has punched the slots and center hole, and blanked the outside diameter, push pins push the slugs from the slots at the same time that the strip is lifted by the guided stripper. The slug from the center hole is pushed through the lower member.





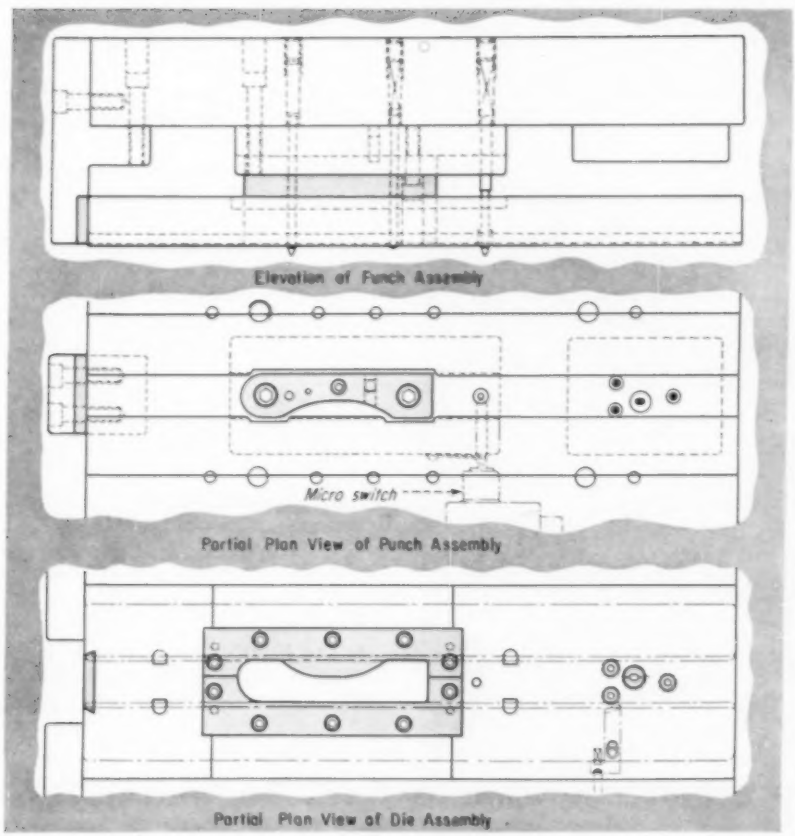
Pierce and blank hard strip...

A tie strap is made from 0.032 in. spring steel hardened to 50-52 Rockwell C. Originally the electric motor manufacturer used a HSS compound die, which averaged 9000 hits per grind; never made more than 15000 pc per grind. A two-stage progressive die featuring sectional carbide die inserts and a solid carbide punch had produced 155,000 pc, at last report, without need for servicing.

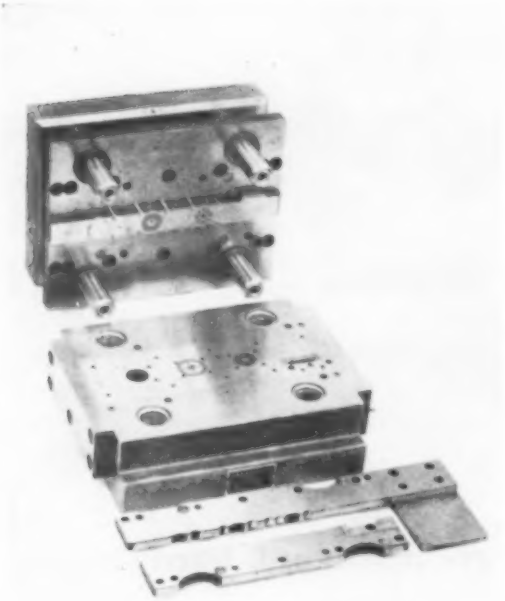
In operation, the 0.032 x 5/16-in. stock is advanced from right to left. At the first station, an elongated hole and three circular holes are pierced. At the idle station, a bullet-nozed spring-backed pilot picks up one of the pierced holes to maintain the 5.000 in. lead. A Micro-switch is fastened to the punch holder and is actuated by the pilot if the latter fails to enter the pilot hole.

The blanking pressure required in this operation is approximately 23 tons. The material is positioned by the bullet-nozed pilot and is held flat, on the die, during the piercing, blanking and stripping operation by means of a spring-actuated stripper. Scrap is chopped off by the carbide-faced punch and the carbide die insert at the left of the assembly.

Total die clearances are: piercing, 0.003 in.; blanking, 0.0038 in. Angular clearance is 0.0023 in. per side, in 1¼-in. thick die sections.



PLEASE TURN PAGE▶



Progressive die with compound station...

A compound tool is normally slow operating, and when the blanked piece is knocked or blown out of the die, control for stacking purposes is lost. Operating speed is limited by how fast the piece can be unloaded from die. On the other hand a progressive die is fast, the part goes down through the die and can be stacked. However extreme accuracy suffers somewhat according to the length of the tool and the number of feeds in a progressive die.

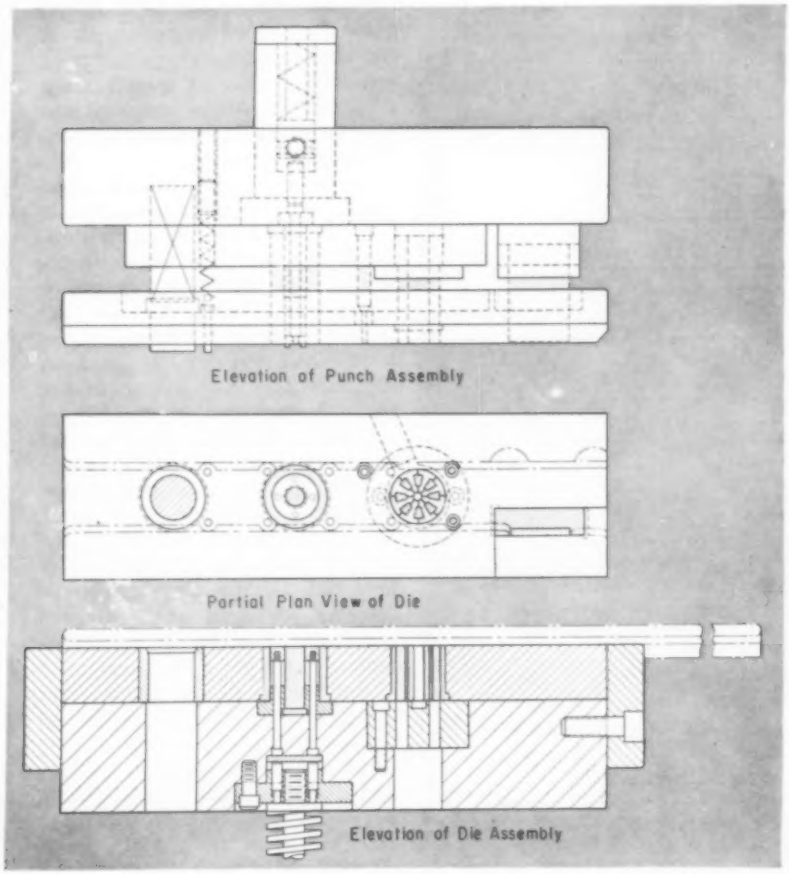
For the small stator lamination shown, stringent requirements must be met: (1) flat, (2) free of burr, (3) OD and ID concentric within 0.001 in. full indicator reading. Production requirements are such that a progressive die, not a compound die, must be used. To get the accuracy required, the portions of the operation involving accuracy are put into a compound station. The only limit on speed is the accuracy of feeding.

In this tool the required flatness and OD-ID concentricity are secured by compounding at the 4th station. Operations are therefore worked out in this sequence:

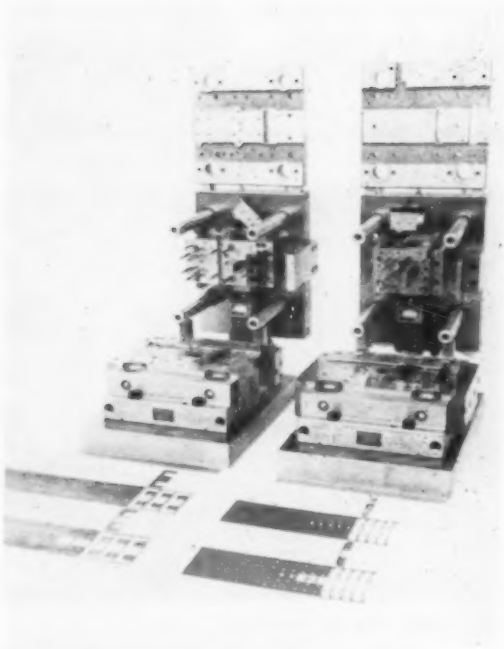
Station	Operation
1	French stop for accurate feeding
2	Pierce slots with segmental tooling
3	Make identification notch
4	Compound station (Cut OD and pierce ID in same station)
5	Idle
6	Push out of strip

The required speed is obtained because the blank is pushed back into the strip at Station 4 and carried along to Station 6, where the blank is pushed down a die hole and stacked.

At the fourth station, the lower member contains the punch for the inside diameter and the blanking ring, plus a spring pad to push the blank back into the strip. The upper member consists of the blanking punch with a piercing hole for the inside diameter.



Die selectively makes pieces in any sequence...

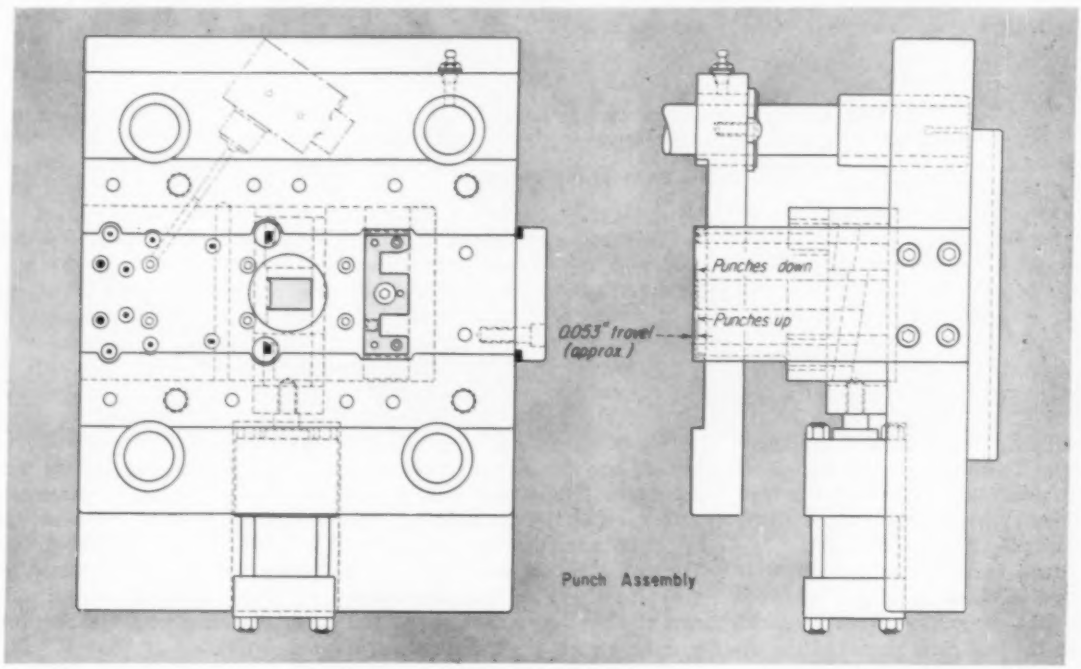


Armature laminations for solenoids (also known as "E's" because of their shape) are required in large quantities. But these pieces are made in "families." An armature assembly may require three of piece No. 1, eight of another piece, etc. The problem:

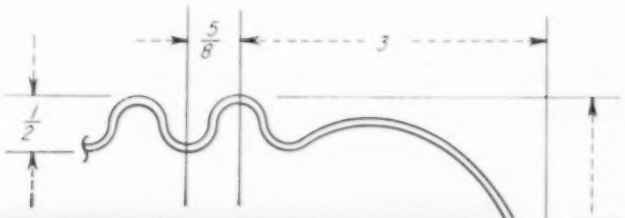
1. How to reduce press setups?
2. How to reduce inventories?
3. How to produce a stack of several different pieces without hand assembly, or a second-operation assembly machine?

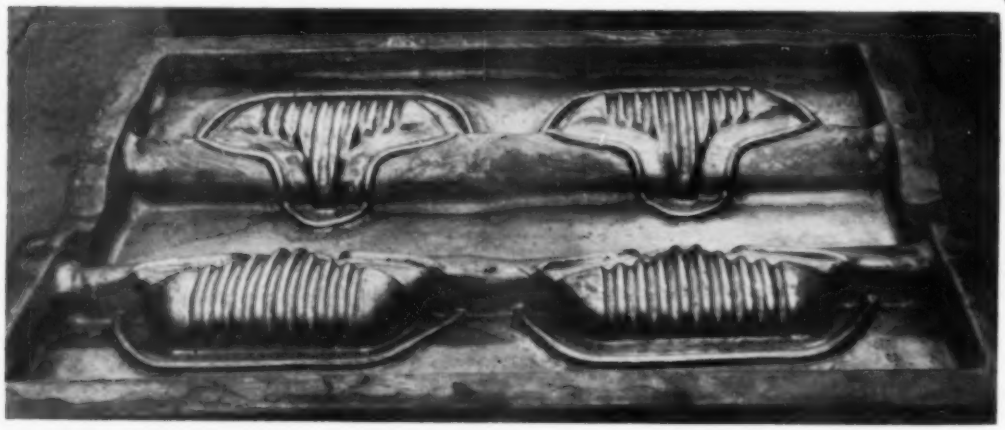
Several years of development have finally produced this tool. The first major break-through was a die with a series of hand-operated slides to activate and de-activate certain punches. With this setup it was necessary for the operator to stop the press and manually operate the slides whenever it became necessary to change the die to produce a different part. This of course had to be repeated until he had the proper balance of production of all the parts needed.

The current tool is designed to operate with a Cyclo-Monitor made by the Counter & Control Corp., Milwaukee, Wis. and a Miller air cylinder. The air cylinder is mounted on the punch assembly to operate the slides activating and inactivating the proper punches. The Cyclo-Monitor controls the production automatically and produces the required number of each part in proper sequence for a stack as used in the final assembly ready for riveting. At present this die is operating at 120 strokes per min. and can operate much faster but is limited by the speed of the final riveting fixtures.



Kirksite dies . . .
move 0.040-in. stainless steel gradually into this complex nozzle contour (section is at one end) ▶





Forming die is operated . . .
with a rubber pad, which a skilled operator must place in the first and second stages (top) as repeated press strokes start the metal moving into position. Last two stages (below) do not need pad

Where stainless is lighter

"Anti-ice" nozzles for F-100 fighter planes are now made of stainless steel instead of aluminum. The stronger material reduces fabricating costs 27% and cuts weight 50%. Shaped like clamshells, the nozzles are formed in halves in a drophammer press, then welded together

JAMES B TEETER
and ROD ROHRBERG,
design produceability,
NORTH AMERICAN AVIATION, INC.
LOS ANGELES

Ice formation on high-speed, high-altitude jet aircraft is a serious problem, especially if it affects pilot vision. The cure for this danger in F-100 and D-100 jet fighters is an "anti-ice" nozzle that directs a stream of hot air against the windshield. Air at 550 F spreads out in the clamshell-shaped nozzle, entering through a cylindrical inlet and leaving through holes in the wide lip.

The nozzle has a complex shape, including severe ribs or corrugations. These are formed in matching nozzle halves, which are then joined by gas-shielded arc welding along the flange and sides.

Until recently the nozzles were made of aluminum; but improved physical properties were required, and the first steel nozzle in the industry was developed. They are made from 0.040-in. 17-17PH ss.

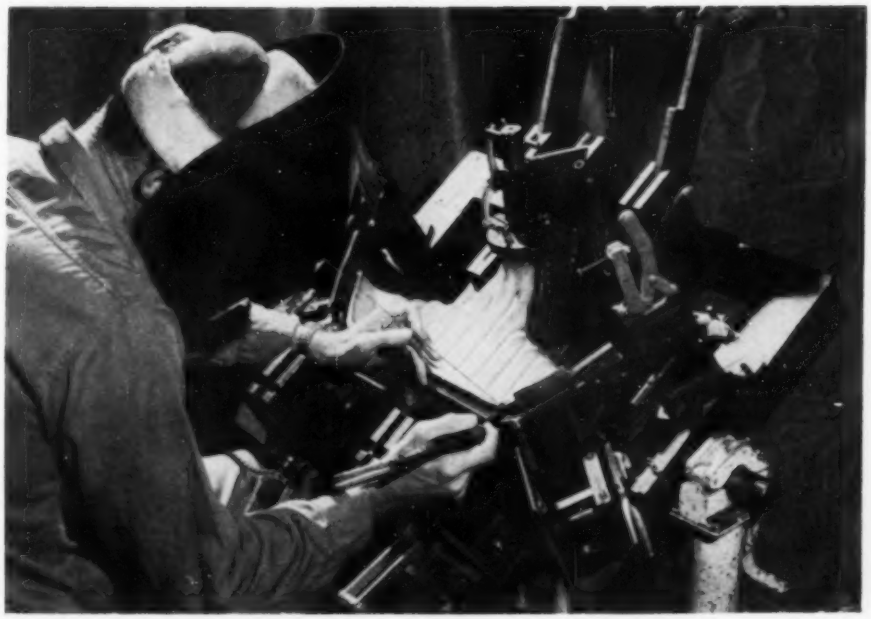
DIE PADS MOVE STOCK

The biggest manufacturing problem was forming the ribs, in which the sheet metal may thin down from 0.040 in. to as little as 0.026 in. Forming is done at a 150-ton Ceco drophammer fitted with Kirksite forming dies, a different set of dies for each nozzle half.

The first dieset has four stages, in which the metal is gradually formed into the clamshell contour. Considerable operator skill is required, especially for placing rubber pads in the first two die stages. The pads start the metal moving in the right direction, and after a few ram strokes they are removed and a final strike with bare dies is made. Pads are not applied in the third and fourth stages.

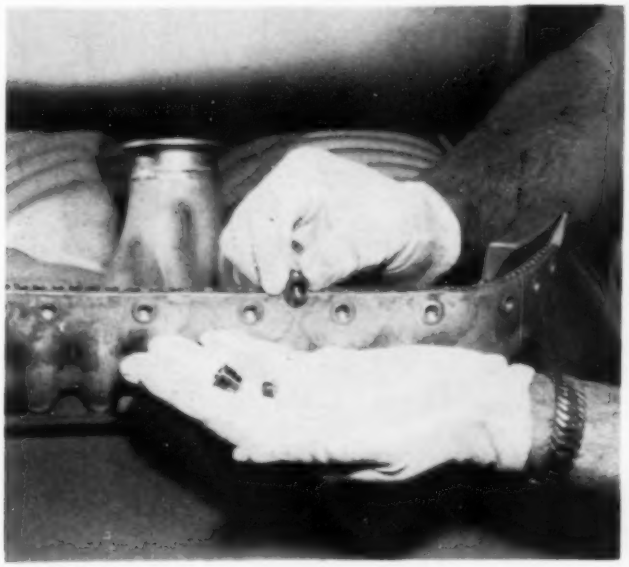
A re-anneal follows the third die stage. Parts are coated with a special solution that reduces scaling in the 1900 F heat of the furnace. After the fourth stage, the parts are sized in the final, single die, and are trimmed and welded.

Holes for air orifices and for fasteners are drilled with the work in a fixture. Fasteners are double-end screw-threaded units with central holes, through which bolts are added to mount the nozzle to the airframe. Stainless-steel flanges are added, then the parts are placed in controlled-atmosphere retorts and inserted in a furnace. Heating does brazing, heat-treating, and cleaning all in one operation at 1900 F.



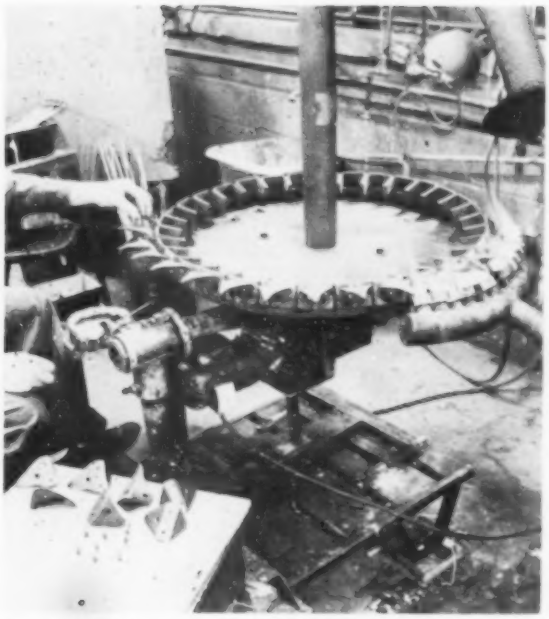
Nozzle halves are welded together . . .
manually with a tungsten electrode and argon shielding. Neck and flanges must be joined

than aluminum

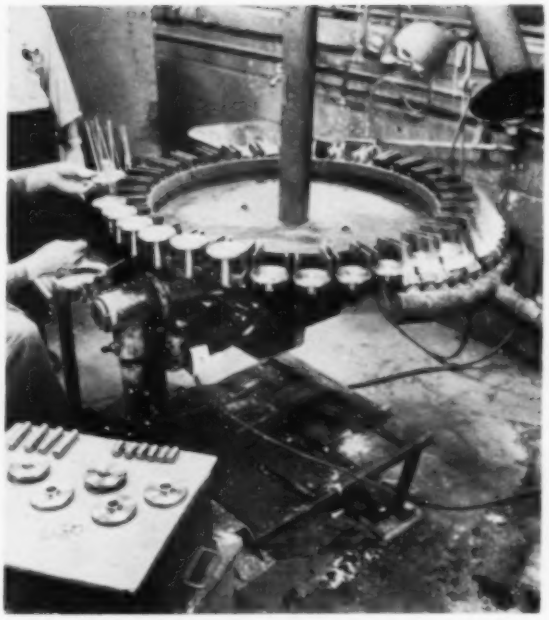


Special fasteners . . .
have rolled threads, like light-bulb bases. These assemble through nozzle from opposite sides. Bolt to hold nozzle to airframe is assembled through hole left in center of each fastener

Stainless-steel fittings . . .
are brazed to nozzles in controlled-atmosphere retort. This is loaded into furnace, where the 1900 F heating cycle also heat-treats and cleans the work



Pin bracket . . .
for automatic pinspotter is an odd-shaped casting with a short stud brazed into one face. By the hand method, only 40 pc per hr could be assembled. Continuous brazing produces 87.5 pc per hr. Speed of table rotation is adjustable to suit cycle time



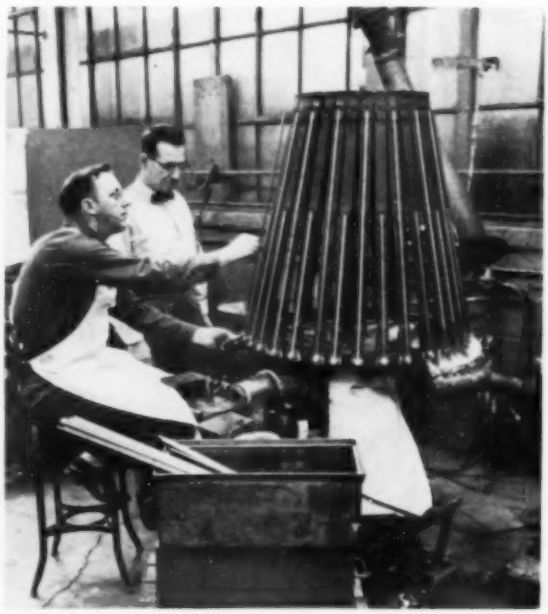
Carpet-roller ends . . .
consist of two disks with an axle brazed into a center hole in each disk. Disks are placed on the side plates of the homemade special fixture and the axles rest on stops, accurately prepositioned. Cost per part is reduced from 17 to 9 cents

Homemade rig brazes automatically

Basic turntable-and-burner combination, designed for interchangeable fixturing, eliminates a brazing bottleneck.

Mounting small assemblies on a continuously revolving turntable that passes them above a set of stationary brazing heads has increased production of close-tolerance parts from 200 to 500%. At American Machine & Foundry's Cheektowaga (NY) plant, methods people designed and built this simple device to overcome a production lag caused by hand brazing.

Consisting of a plain rotary table and an adjustable manifold burner, the device can be fitted with fixtures to accommodate a wide variety of parts. A manually adjustable ¼-hp motor permits speed control for the various brazing times needed with different setups. Three removable workholding fixtures are designed as rings. A fourth fixture is used vertically. Seven different parts are brazed with this machine.



Long and short tierods . . .
have end fittings brazed to them simultaneously in a setup using these special supports. Tierods requiring fittings on both ends are simply inverted and passed through the brazing cycle a second time. Production has increased from 20 to 30 single-end fittings per hr to 95 per hr and from 15.5 double-end fittings to 49 assemblies per hr. Operator simply loads, unloads, and controls speed and flame

HOW TO BALANCE COMPANY PROFIT AREAS

SPENCER A TUCKER, Management Consultant, LITTLE NECK, NY

Production turbulence can cause drastic fluctuations in sales and in capital. Can the effects of these changes be measured in dollars, to give the plant manager realistic control of all areas of his business? How do the production manager's responsibilities relate to his company's over-all financial balance? This article—another in a continuing series on Small-Plant Management—shows how production, sales, and capital can be integrated

Production, sales, and capital are complex subjects. But trying to integrate variables in one with variables in the other two is like trying to play several three-dimensional chess games at once. It is often possible to integrate these variables with highly complex mathematical models. This refined approach to the integration of all facets of a business has come to be known as Operations Research, and its techniques are generally beyond the scope of the average small-plant manager. Indeed, a whole corps of experts is needed here to advise management.

But the inter-relationship of production, sales, and capital at a given moment can be grasped handily when realistic, simply derived *managerial controls* are available. In this article we shall consider both short-range and long-term managerial questions, with controls that reveal the status of these inter-relationships and their effect upon the company at a given moment. Those problems that arise regularly, and to which a manager must immediately turn his attention, will be examined. Simple mathematics, rather than complex formulas of Operations Research, will be employed to show how certain of the variables act. Previous articles in this series (*AM*—May 20, Jul 1, Aug 12, and Nov 4 '57) developed separate sets of managerial controls for production, sales, and capital.

INTEGRATE ALL AREAS

Consider the problem facing a plant in which a set of production ratios shows that a constant, moderate amount of maintenance is required to keep a certain machine in normal operation. Ostensibly the machine should be replaced. If a check with the sales department reveals that the greater capacity of a new machine can be met by increased sales, management has even more apparent reason for buying a new machine.

Unfortunately the purchase is sometimes made without considering its effect on the company's capital structure. As a result, the dollar loss caused by the unsound capital expenditure can more than offset the dollar gains made possible with the new machine; the company is now in a worse position than it was with the slower, older machine.

The above example illustrates the importance of knowing how far the dollar will go in *all* areas of a business. Another perspective that must be clear and dollar-evaluated is the time sequence of managerial actions, that is, events to which the manager must turn his attention first and those that can be delayed. In the aforementioned example, the dollar value of the maintenance and the loss of capacity as seen by sales may not, on a week-to-week basis, be high enough to merit top priority. Yet these losses over an extended period may be appreciable, hence subject to closer review than they seem to deserve at first glance.

Obviously it is dangerous to make a decision in one area of company affairs—no matter how bright the picture—without considering its effect on other areas. What should be done, for instance, when a company's managerial controls reveal, through its sales ratios, a

low penetration in a certain area and a decreasing customer potential? Although these ratios cannot be expressed as expenses (as with the money spent for machine maintenance), they can be converted to dollar figures. Actually, these figures can be termed dollar loss of *potential*, for they have not affected the company treasury—for the immediate, anyway.

Once again the company's capital structure must be analyzed: Will hiring more salesmen improve the marketing picture? Will expanded sales offset the expenditures needed to increase capacity? Problems that arise here are intimately tied in with the concepts of designing for future operations. In the final analysis, the company is faced with this question: Will the return from added sales (assuming that market penetration *will* increase in the future) be sufficient to absorb the additional expenses created by the budget increase?

COMMON GROUND FOR RELATING RATIOS

We have shown in previous articles that production economy can be controlled by ratios developed from hour-and-dollar elements that make up production. In the same way, ratios can be developed to control sales activities. We have also been able, through the use of control ratios, to relate sales activities to production activities. In isolated events, we can measure the effect that a change in production has on capital and sales, as well as the way that a change in sales policy influences production economy and, ultimately, capital.

As yet, however, we have not attempted to show the *constant inter-relationship* of production and sales with capital, where changes in the former automatically provoke changes in the latter.

How do we inter-relate these three areas, so that the effects of these changes can be measured with some degree of accuracy? The obvious answer is to find some way to relate their characteristics, as expressed in the company's balance sheet and profit-and-loss statement.

The profit-and-loss statement, issued periodically, shows only the smoothed-out results of operations; peaks and valleys of operating—so necessary to know for efficient trouble-shooting—are hidden. Control ratios for sales and production, composed of P & L data, can be used by management in the interims between issuance of these statements.

Theoretically, balance sheets—with their information on the company's financial structure—could be issued as often as P & L statements. But obtaining balance-sheet data so frequently is too costly (particularly with regard to inventories) and impractical.

Because it is impractical to obtain a direct mathematical relationship between an operating ratio and an asset-and-liability ratio, we must solve in another way the problem of inter-relating production, sales, and capital elements. We must find some one thing in the company's structure to which the operating results (P & L) *during a period* and the state of business health (balance sheet) *at the end of the same period*, can be related with validity. What is needed is a common ground, a crossover point, that is affected by events throughout any area of the company. *Capacity* is such an entity.

MEASURING COMPANY CAPACITY

The definition of capacity is not a simple one. It is a highly technical term among accountants, especially in the determination of break-even calculations. In manufacturing terms, capacity denotes the ability to house and use the ingredients of manufacturing and, with them, to produce for sales. These ingredients are space, equipment, raw materials, people, and capital; they must be present in proper proportions if operating economy and capital are to be kept healthy.

Merely knowing the physical quantities of these ingredients—such as 40,000 sq ft, 20 machines, $35,000 inventory, 60 people, and $100,000 capitalization—is not significant unless each of these quantities is related to operating results and the cost of these results. With the P & L statement the effect of their *utilization* can be evaluated; the balance sheet reveals the *impact of their acquisition*.

If new machines are purchased, other capacity ingredients—notably raw materials, workers, and capital—may go up proportionately. If the equipment increase is large, space may also have to be added. In the evaluation of capacity or of external effect on capacity, all the ingredients must be considered if serious distortions are to be avoided. It must be stressed that each of these elements has its effect on capacity, and that each acts in a different manner. In the above assignment of values, acquiring more space (to, say, 60,000 sq ft) increases only capacity *potential*, which will not become a real increase in capacity until more work centers, people, and capital are added to support the additional space.

Measuring the rate of change or the magnitude of the change is a criterion for evaluating the progress of a manufacturing business. Here we are dealing with relative, not absolute values. For example, if we can determine the amount of change in inventory turnover and the amount of change in direct labor which both cause the same change in capacity, then we have a valid basis for comparing direct labor with inventory turnover.

This concept is similar to the mathematical theorem which states that if two things are equal to a third, they are equal to each other. And the concept can be carried further: If two things are partially equal to a third, they are partially equal to each other. Finally, if the different rates of change of two things each cause the same change in a third, the two may be said to be related. Mathematically, this ratio may be expressed as $\triangle$x-direct labor or Δy-inventory = Δz-capacity.

This particular relationship can help to relate inventory levels to the labor budget, but more importantly it reveals when inventory exceeds normal stock levels and is also a check on purchasing as well as on the "normality" of stock levels.

Similarly, a change in sales or a change in invested capital can cause a change in capacity. This relationship is valuable for determining how sales increases might affect invested capital; it can lead to comparisons with a projected profit that will show whether the increase in profits is worth, say, doubling invested capital and tripling sales. From this comparison management can, by considering borrowed capital as well as invested capital, determine whether borrowing money can really pull the company into a higher profit zone.

Another valid control compares (by rates of changes) sales and tangible net worth. Because both can affect capacity *measurably*, they can be related to each other. Through this relationship, a company can find out what its upper sales limit should be before the dangers of over-capitalization set in. This reckoning is similar to a break-even chart that shows the minimum operating activity necessary to recover expenses (which is also what a cost-recovery statement does in pinpointed

fashion). Both financial controls and the break-even chart are needed to present a clear picture of a company's financial vulnerability—just as a cost-recovery statement, which gives operating results, reveals the economic justification for an expansion.

SHORT-SIGHTED PLANNING

What can happen when a company purchases new equipment without analyzing the *total* effect of the purchase on production, much less on sales and the company's financial structure? The following case history—which for illustrative purposes paints a somewhat bleaker picture than would normally be found—shows the danger of short-sighted planning, where only the most obvious production costs are considered.

Our fictitious company's problem was one that faces many small shops today: Should the company's non-automated production line be replaced with automated equipment? Here the company, after making a simple comparison of costs on the present line with those on the proposed line, felt that the investment was well justified.

I. Present (non-automated) line

Given: Direct-labor costs:	$1.50/hr average
Production space:	2000 sq ft
Space costs:	$1.50/sq ft
Parts output:	20/hr
Annual use:	2000 hr

Operations	D-L workers required	Cost/hr for D-L
Hand drilling, c'boring, reaming	16	$24.00
Footpress inserting	6	9.00
Hand assembly	10	15.00
	Total costs:	$48.00

a. Direct-labor cost per part
$= \$48.00 \div 20 = \$2.40$ each

b. Space costs per part

$$= \frac{2000\ ft^2 \times \$1.50/ft^2 \div 2000\ hr\ annual\ use}{20\ parts/hr}$$

$= \$0.075$ each

II. Proposed (automated) line

Given: Direct-labor costs:	$1.75/hr average
Production space:	1000 sq ft
Space costs:	$1.50/sq ft
Parts output:	100/hr
Annual use:	400 hr*

*If demand for parts remains same as in I (Automated line has 5 times the output of the present line)

Operations	D-L workers required	Cost/hr for D-L
(Operations in 1 performed automatically)	4	$7.00

a. Direct-labor cost per part:
$= \$7.00 \div 100 = \$0.07$ each

b. Space costs per part:

$$= \frac{1000\ ft^2 \times \$1.50/ft^2 \div 400\ hr\ annual\ use}{100\ parts/hr}$$

$= \$0.0375$ each

Apparent savings with automated equipment:

a. Direct-labor cost per part:	$2.33
b. Space costs per part:	0.0375
Total apparent savings	$2.3675

Unfortunately, the company's superficial analysis stopped at this point. Someone put down a figure of net savings per piece of $2.3675, multiplied it by the annual pieces produced (100,000 at present), and arrived at an annual saving of $236,750. This latter figure was divided into a $200,000 cost of automation, and the result showed that the investment would ostensibly pay for itself in 0.84 years.

Readers of this series should immediately react by objecting to the *exclusion of overhead* from these calculations. When total overhead costs are added to the expenses for direct labor, the true hourly costs for both systems can be obtained:

	I	II
Direct labor:	$ 48.00	$ 7.00
Total overhead:	52.80	166.00*
True hourly costs:	$100.80	$173.00

*Based on 2000 hours' annual use

(Notice that total overhead for the automated equipment is more than three times that of the non-automated equipment. This increase is due principally to the large depreciation expense of the new, higher-priced equipment. This cost must be included, in order that customers rather than the company ultimately pay, via the selling price, for the equipment.)

Now it is possible to find the true cost of each part produced. This is accomplished by the machine-hour-rate or facility-costing method, where the output per hour is divided into the true hourly cost of operating:

I. $\$100.80 \div 20 = \$5.04$ (present)

II. $\$173 \div 100 = \$1.73$ (proposed)

Evidently the cost of producing each part with automated equipment is only slightly more than one-third that of making each part with the present equipment. But notice that the above figures are based upon total-overhead costs for 2000 hours of annual facilities use. We have seen that the automated equipment, operated 2000 hours annually, produces five times the output of the present equipment. If *present production levels* are to be maintained with the automated line, that line will be in use only 400 hours per year; as a result, overhead costs per hour will increase five-fold. The true cost per part with the new equipment increases proportionately:

II. $\$7 + (\$166 \times 5) = \$837$ per hour

$\$837 \div 100 = \$8.37$ each

We have shown that each part can be produced, at present production rates, for $5.04 on the old equipment. Obviously the company will sustain a loss of $3.33 per part if it installs the automated line, unless it is able to increase sales so that production can rise. *At present production rates, overhead expenses are simply too high to justify the automated equipment.*

PLANNING—THE LONG-RANGE VIEW

If our hypothetical company still wishes to buy the automated equipment, it will have to increase production. And if production is increased, sales must rise. These considerations obviously affect all areas of the company's structure—not just production.

How much will production have to rise? The initial approach to a solution of this question should be to find the break-even point of the *two systems*: that level of production activity at which costs of both production lines are the same. The problem can be stated in another way: If the present equipment, operated 2000 hours per year, can produce a part for $5.04, how many hours per year should the automated equipment be operated, to produce the part at the same cost?

The following table compares costs of operating the *automated equipment* 2000 hours and 400 hours per year:

Annual hours use:	2000	400
Yearly overhead:	$332,000	$332,000
Hourly overhead:	$166	$830
Hourly direct labor:	$ 7	$ 7
Total hourly costs:	$173	$837
Hourly production:	100	100
Cost per part:	$ 1.73	$ 8.37

To find the annual-hours break-even point, an equation is set up containing yearly overhead expenses and overhead expenses for each part produced. (Note: If direct-labor cost is $7 for 100 parts per hour, the direct-labor cost for each part is 7¢; the *overhead cost* for each $5.04 part then becomes $4.97):

$$\frac{\$332{,}000}{X} = \$4.97 \times 100, \text{ or } X = 668 \text{ hr}$$

Thus the proposed automated line must be operated 668 hours a year—67% more than the 400-hours activity of the present equipment—in order to meet the present $504 cost of producing each part. In addition, sales will have to increase 67% to accommodate the new production rate.

But management should not commit itself to a large capital expenditure, with its attendant risks and headaches, just for the sake of breaking even. A realistic sales forecast should show that sales can be increased to two or three times the present volume before management risks making the capital investment. Incidentally, if sales could be increased five times (that is, if maximum-capacity use of the automated equipment could be realized), each part would cost $1.73, leaving an additional profit of $3.31 per part.

What we are considering here is a rate of change in the magnitude of sales and its effect on capacity (which includes capital). If this positive change in sales is realized, then there *can* be a positive change in capacity that *may* justify a change in capital structure.

INCREASING SALES

Can the sales department increase sales at the required increment? How much will inventories have to be increased? If the market that the company serves is able to absorb the increased production, what will be the additional contact and administrative expenses for the added activity?

Obviously the additional expenses created by increasing production and sales volumes will raise the break-even point. Theoretically, to meet present production costs of $5.04 per part, sales of production from the automated line should be increased 67%. But added expenses needed to increase sales—more salesmen, higher inventory levels, greater administrative costs—boost the break-even point even higher, so that twice the present volume in sales actually is necessary to break even with the present method.

To maintain the $5.04-per-part cost at the new break-even volume of twice the present, yearly overhead expenses must rise:

$$\frac{X}{2 \times 400} = (\$5.04 - \$.07) \times 100$$

$$X = \$397{,}600$$

Because of this sizable increase in overhead expenses, and because it is interested in much more than just breaking even, management decides that 2.5 times present volume should be the basis for deciding to proceed with plans to buy the automated equipment.

Let's see what this decision does to two prime business areas: company economy and company health.

Realistically, management cannot expect its volume to double the first year—which in this case would produce a one-year amortization term—so a time schedule is projected for reaching the two-times-sales figure:

Year	*Expectation**
1	1.3
2	1.4
3	1.6
4	1.8
5	2.0**

*No. times present volume

**Break even

The first observation that can be made from the above schedule is *not* that the company breaks even in 5 years (for this is not true, as we shall see later). It does mean that when the fifth year is over, the *opportunity* for breaking even is presented, all previous years requiring company subsidy. Here's the cost to the company in the first five years:

End of Year	Annual Hours Activity	Yearly Overhead Expenses	Cost Recovery	Subsidy
1	520	$397,600	$258,440	$139,160
2	560	"	278,320	119,280
3	640	"	318,080	79,520
4	720	"	357,840	39,760
5	800	"	397,600	0
			Total Subsidy:	$377,720

Naturally the subsidy period and the amount of subsidy are direct functions of the rate of change upwardly of the successive sales volumes. The above tabulation shows that when the fifth year is over, at the sales progression indicated earlier the company can recover all its expenses for that year. But before all expenses can be fully amortized for the investment, annual activity must be successively increased, until an amount equal to previous under-recovery (or subsidy) is over-recovered. With the same sales progression, this over-recovery occurs at the end of the 9th year.

This entire example is qualified only by the rate of sales progression. If 800 annual hours can be reached before the end of the fifth year, the amortization comes more quickly. In any event, the period of amortization is twice the zero subsidy year, minus one, in years.

As production rises, unit-overhead costs decrease; as a result, the cost of producing each part decreases and profits rise. Now the company can consider reducing its sales price and passing on production savings to customers.

Naturally this schedule assumes that all other things remain equal, but they rarely do. Variations in the profit margin will have an effect upon subsidy, and so will internally changing costs.

What has been happening to the company's state of health during this amortization period? Subsidy or no, if cash is to be liberated by activity it must go through its cycle, and this can be very serious in early years. Heavy financing is necessary to start the program, and the possibility of insolvency arises. Company health can be checked by examining the current ratio (the ratio between current assets and current liabilities). If in the first year this ratio goes from, say, 2:1 to as low as 1.3:1, the company's susceptibility to insolvency is very great, and sources of supply may be cut off.

Also, of necessity the company must be involved in

higher inventory levels, and the projected rate of inventory turnover must be examined. The same is true of the fixed-assets ratio (the percentage of the business tied up in fixed assets). No matter how good an activity projection may look, balance-sheet projections and ratios must be formulated to insure solvency and growth while progressive activity is going on.

TROUBLE AT XYZ

Here is another case history that demonstrates how a change in one area of a business affects all other areas drastically.

The XYZ Company—a small metal-stampings plant that wanted to step up sales—increased its sales staff, hired a top sales manager, and then launched intensive marketing and promotional campaigns. The costs of doing all these things were estimated and compared with what profits would be on the additional sales. Everything looked fine at this point.

But, like management in many small companies, XYZ officials did not investigate the subject further. The company was making a 10% profit on annual sales of $300,000. *If*, management reasoned, the same profit percentage could be obtained from sales of $600,000, and *if* the additional promotion cost only $15,000, then company profits should increase $15,000 yearly—*if* the balance sheet remained healthy. The company was trusting too many intangible *if's*, as the following explanation will show.

These operating conditions were in existence before the sales drive started:

- Drawing presses busy about 1600 annual hours
- Blanking and piercing presses busy about 1300 annual hours
- Buffing wheels busy about 1500 hours
- Degreasing and plating facilities busy 1900 hours
- Adequate space available for adding facilities
- Working more than one shift impossible, because of local labor market

Management inaugurated the sales drive because it was annoyed at seeing presses standing idle about one-third of the time. Because the majority of the presses were of the blanking and piercing variety, it appeared that *all* the presses were being operated at the low rate of this type. On the other hand, the plating room, an expensive installation, was almost fully occupied. The accompanying table shows what happened when sales rose 50%.

Although company sales rose by 50%, profits were wiped out by unrecovered costs and the added costs necessary to promote sales. (Note: Actually, in machine-hour-rate formulations, added costs for sales promotion—here considered separately to avoid complicating the example—are integrated with the hourly rates, so that these rates rise proportionately; facility costing will be treated fully in a future article.) The company soon filed bankruptcy papers.

Facility use should have been more nearly balanced, so that as full a recovery as possible could have been obtained from the equipment. It didn't take long for the sales drive to require a duplication of plating facilities. But the second facility was utilized only 850 hours out of a possible 2000 (or a total plating-facility use of only 2850 hours out of a possible 4000). As a result, expenses for 1150 unrecovered hours were sustained by the company. Although the sales drive did not require duplication of blanking and piercing presses, all other facilities had to be duplicated. The unrecovered expenses here, brought about by the lack of balance in facilities use, were considerable.

This example doesn't prove that a company of this size should not actively try to boost sales, provided that sales will boost profits. Such a move would be appropriate in a company of the same size and with the same equipment, if a 50% increase in activity did not make duplication of facilities mandatory. Profits would go up, sold hourly rates would go down, and sales would continue to increase—provided expenses for inventory increases, necessary to support the higher activity, did not endanger company health.

Again we turn to the idea of *capacity* as the determinant. For if there is linearity between sales increases and activity increases, then the difference between maximum and existing capacity, taken as a percentage of the former, should be a reasonable guide to what significance the sales drive should have and what it should cost.

CAPITAL AND CAPACITY

A frequent misconception in running a business is that it is a good thing to have more capital on hand than is necessary. The inaccuracy of this assumption can be verified with several of the control ratios described in previous articles. The uneconomic effect of too much capital on hand is that it does not turn over fast enough; all of it is not vital to the operation of the business. The excess money, dollar for dollar, is not providing the same return that less money would, hence it could be better invested where the return is higher.

When excess capital is put into inventory "just to be on the safe side," a real danger can arise. The test of this practice is to see whether this larger inventory really expands capacity. If it does not, the expanded inventory is relatively useless.

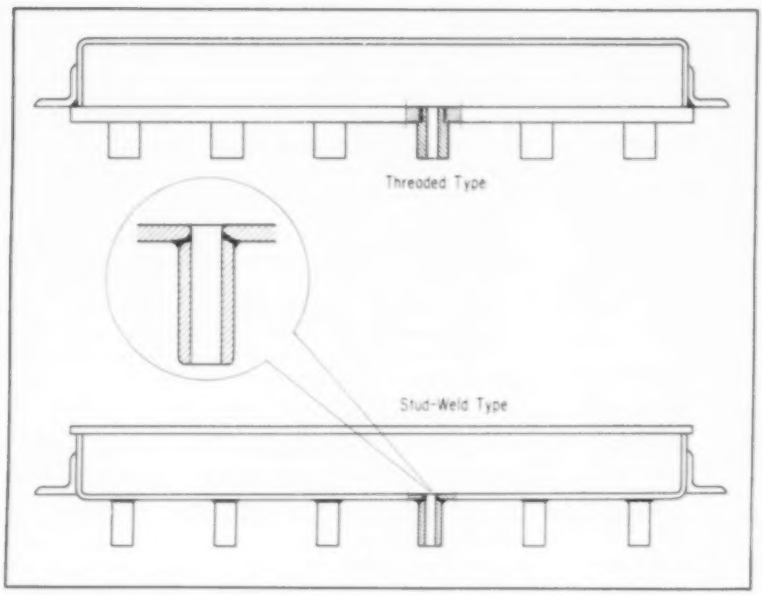
Capacity, with its ingredients, is like an ocean-going convoy that can move only as fast as its slowest ship. Company expansion can be held back if just one factor cannot keep pace. Capacity suffers when increased personnel and equipment cannot be fitted into present space; when the cost of obtaining additional business exceeds the gains from expanded operations; and when inventories cannot be turned over fast enough to keep pace with production.

Facility	Present Activity	150% Present Activity	Duplication Of Facility	Unrecovered Activity of Duplicate	Hourly Cost	Total Unrecovered Cost
Drawing presses	1600 hr	2400 hr	yes	1600 hr	$11.40	$18,240
Blank and pierce	1300	1950	no	—	8.10	—
Buff	1500	2250	yes	1750	6.40	11,200
Plating	1900	2850	yes	1150	19.20	22,080
					Total Unrecovered Cost:	$51,520

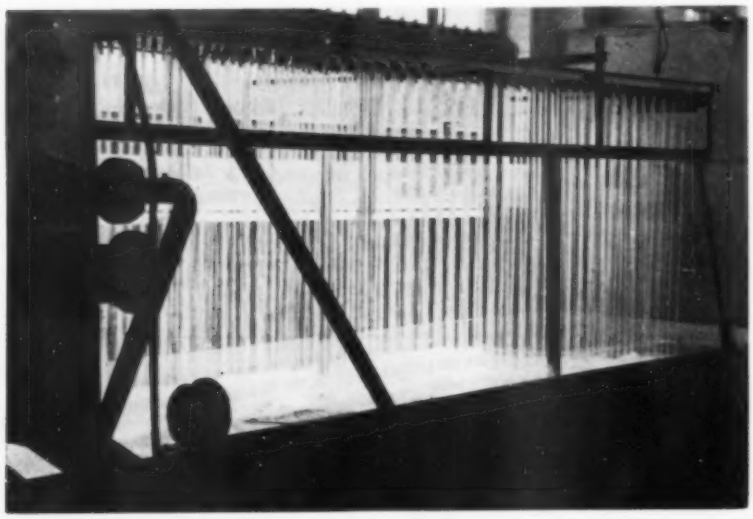
Drilled studs make nozzles

Studs are welded to a manifold, then drilled, reamed, and chamfered to provide squarely aligned, securely attached nozzles

WILLIAM NEKOLA, vice president,
BARRY-WEHMILLER MACHINERY CO, ST LOUIS, MO



Spray nozzles cannot shake loose . . .
or develop leaks, and manifold can be made of lighter material, when threaded nozzles are replaced with studs



Spray of cleaning solution removes labels . . .
in bottle-washing machine. Spray unit is specially mounted here to show jet pattern

Stud welding has stepped into a new role at the Barry-Wehmiller Machinery Co, where studs have replaced threaded spray nozzles on the company's automatic bottle-washing machine.

In operation, the bottle-washing machine removes paper labels with a strong spray of cleaning solution from a battery of nozzles. The nozzles must be 9/32 in. in dia and 1¼ in. long, and their inner end must not project into the manifold that supplies the cleaning solution. Otherwise, the loose paper pulp in the solution would hang up and clog the nozzles.

Threaded nozzles would satisfy these requirements, but a more satisfactory answer is given by unthreaded studs welded to the manifold and drilled. The resulting smooth-bore nozzles do not project inward; they can't work loose; and they permit a lighter-gage material for the manifold.

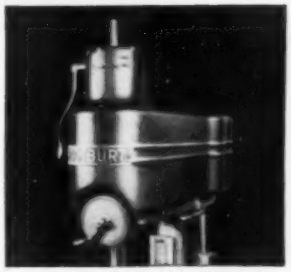
In the present design, the bottom and sides of the manifold are a formed channel of 10-gage HRS, 14½ in. wide by 1½ in. deep. Locations are laid out on the channel for 192 to 240 nozzles, depending on the size of the unit. Then the studs are welded on with a standard Nelson stud-welding gun.

With a stud and a porcelain ferrule in place on the end of the gun, the operator holds the unit against the workpiece at the proper location and pulls the trigger. The stud is automatically retracted from the work approximately 1/16 in. and held there for a controlled period of time. The ferrule not only shields the arc but also prevents oxidation of the weld metal, concentrates the welding heat, and forms a fillet around the base of the stud.

When all the studs are welded in place and checked for squareness, they are drilled through and reamed. Then they are chamfered to deburr and to increase the efficiency of the orifice.

The assembly is completed by welding 10-gage top and end pieces to the channel to form a closed manifold. Angles are welded to the sides for support.

FOOTBURT



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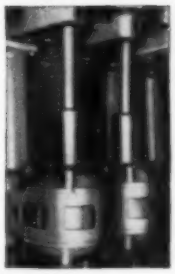

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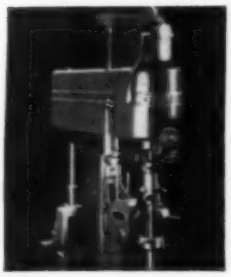

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CLEANING

Cast iron or other porous metals should be preheated (500 to 800 F) to drive out oil or other foreign matter. In some cases chemical cleaning may be necessary before preheating. Excessive carbon resulting from preheating may be removed by sand or grit blasting.

UNDERCUTTING

Remove stock in a plane parallel to the intended finished surface, to minimize feathering of the sprayed-metal deposit. If the wear is 0.020 in. or less, it is frequently desirable to spray molybdenum without undercutting.

The depth of undercutting is determined by strength requirements and the amount of wear expected. The wear allowance must be determined for each individual job. Use of the metallic-spray bonding method as the base coat can frequently reduce the depth of undercut required.

Table 1—Weights of Wire, Lb /Ft

Metal	Diameter of Wire		
	11 B&S Gage (0.090 In.)	1/8 In.	3/16 In.
Aluminum	0.00750	0.01410	0.03175
5% Silicon aluminum	0.00760	0.01420	0.03195
Aluminum bronze	0.02060	0.03912	0.08800
Tobin bronze	0.02410	0.04550	0.10238
Copper	0.02520	0.04740	0.10665
Monel	0.02520	0.04750	0.10688
Nickel	0.02430	0.04580	0.10305
Carbon steels	0.02200	0.04170	0.09383
Stainless steels	0.02220	0.04170	0.09383
Zinc	0.02000	0.03760	0.08460

Fig. 1—Method of undercutting for spray bonding

SURFACE ROUGHENING

There are several methods and combinations of methods for obtaining roughness:

1. Blasting
2. Electric bond method
3. Metallic - spray bonding method
4. (a) Groove and rotary roughing tool method
   (b) Groove and knurling method
5. Studding: with drive screws and with machine screws
6. Combination of 1 and 2, or 1 and 3
7. Combination of 5, 1 and 2, or 5, 1 and 3
8. Combination of 4 and 2, or 4 and 3

Blasting is seldom used alone as preparation for building up flat surfaces. Blasting should be done with G-16 to G-25 clean, sharp crushed-steel grit or similar-size aluminum oxide.

Electric bonding is used to prepare surfaces too hard to roughen satisfactorily by blasting or other mechanical means. Small, irregularly shaped particles from a nickel electrode are fused to the surface. A special transformer is necessary. The ground cable should be attached to the workpiece as near to the undercut surface as possible. The electrode material is applied with a light touch, with a brushing or rocking motion until not more than 15% of the surface is unprepared as estimated by visual examination.

The electric-bond method may also be used on "U" or "V" grooved surfaces. Here the deposit is applied only to the ridges or tops of the threads.

The metallic spray-bonding method consists of spraying molybdenum wire directly onto a clean surface.

Molybdenum in the sprayed form has a tensile strength higher than high-strength sprayed bronze, but somewhat lower than most sprayed steels. The metal bonds equally well to steel in the hardened or soft state, and to most white metals, such as zinc or aluminum, but will not bond to copper or copper-base alloys. Molybdenum should be used only on work which will not be subjected to temperatures over 600 F.

To restore a surface that requires only a small amount of metal, the only preparation necessary is to clean the surface by machining, grinding, blasting or wiping with a clean emery cloth. Frequently the molybdenum itself is all the build-up that is required, but if a high finish is necessary the surface should be undercut enough to allow for 0.002 to 0.003 in. of molybdenum plus 0.002 to 0.003 in. of steel or stainless steel. It is necessary to mask areas that are not to be coated, because molybdenum adheres to smooth surfaces.

Only acetylene should be used as the fuel gas for spraying molybdenum. Adjustment of both the acetylene and oxygen pressures is critical. Molybdenum will oxidize badly and not bond if a slight excess of oxygen is used.

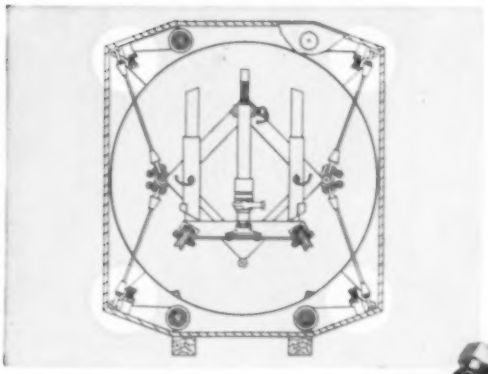
Average thickness of sprayed metal should be about 0.0015 to 0.0020 in. Grooves (or threads) should be used for all coatings over 0.050 in. thick.

GROOVING

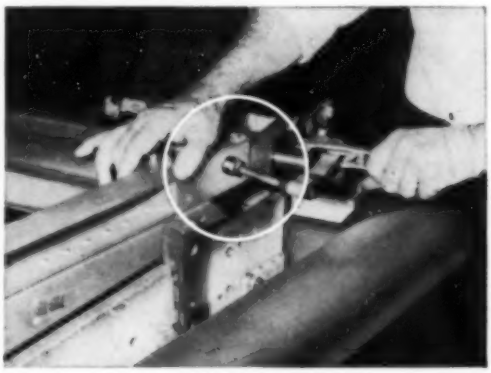
For all coatings 0.050 in. thick or over, "U" grooves, "V" threads or studs, are recommended. They should also be used for all high-shrinkage coatings over 0.030 in. thick, such as produced with 0.10 carbon steel or 18-8 stainless steel. Low-shrinkage coatings, such as

TOOLING IDEAS your shop can use!

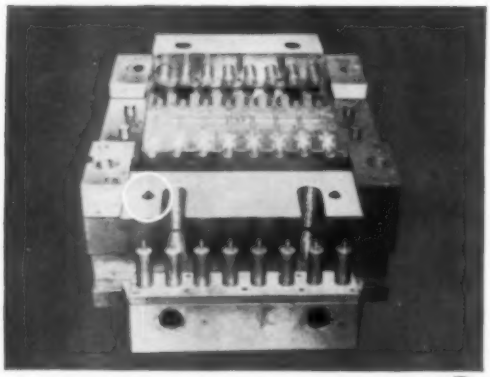
Shown below are just a few of the many uses for Vlier tooling accessories. Although these standard accessories are primarily used in jigs and fixtures, many companies are using them to replace custom-made devices in original equipment.



SPECIAL SWIVEL-PAD CLAMPS for a missile container manufacturer incorporate the remarkable Vlier ball-joint construction. Eight Swivel-Pad Clamps are used to release tension on cables which suspend the missile in its shipping container. This particular model withstands 21,000 load pounds.



CLAMPING PARTS WITH OFF-ANGLE SURFACES is no problem when Vlier Toggle Pads are used with a toggle clamp as shown here. The pad swivels 10° each side of the center line, assuring solid clamping of the part with no damage to the surface.



THIS 16-CAVITY, SIDE-ACTION PLASTIC MOLD uses four Vlier S-66 Spring Plungers as *detents* to lock the side-action bar in its travel to the center of the mold, eliminating costly, custom-made detents formerly used.

A glance at the new 1956 Vlier catalog will probably suggest many applications in your shop where you can standardize on Vlier accessories. Write for your free copy today.

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on all Vlier Torque Thumb Screws protects working parts from dirt, chips, and other foreign matter. Truare ring makes disassembly easy. In all Vlier Torque Thumb Screws the ball-check is perpendicular to the screw axis, preventing uneven wear and wobble.

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Insist on Vlier Tooling Accessories... there's still no substitute for qual

Metallizing of Flat Surfaces—II

produced with 0.80 carbon steel or high-chromium, high-carbon-type stainless steel, may be applied in thicknesses up to 0.050 in. without grooves or threads.

GROOVE AND ROTARY ROUGHING TOOL METHOD

Two separate operations are: first, cutting "U" grooves in the undercut section, second, spreading and roughening the lands or tops of ridges produced in the first operation. This method gives one of the strongest bonds on all machinable metals.

The cutting of grooves is accomplished with a round-nosed tool, Fig. 2. Sixteen grooves per inch may be obtained by any suitable machine. The groove should be approximately 0.025 to 0.030 in. deep and may be cut in one or several passes. The groove should be approximately 0.045 to 0.050 in. wide. The grooves should be so spaced that the ridges or lands between the grooves are approximately 0.015 to 0.020 in. wide. The grooving should cover the entire length of the undercut section if possible.

The spreading and roughening operation is best accomplished with a special rotary tool. The tool is fed into the work at 0.005-in. infeed and is traversed over the lands of the grooves at a feed of about 0.020 in. The roughening operation should be continued until the land is spread out and the land width and groove width are approximately the same (0.030 in.). When this operation has been completed, the U-shaped grooves will have been converted into a series of dovetails.

GROOVE AND KNURLING METHOD

The thread-and-knurl method requires two separate operations. The first consists of cutting 60° "V" threads in the undercut portion of the surface. The second operation is that of upsetting or cold forming a uniform pattern of hooks or keys in tops or ridges of the threads. This method also gives a strong bond.

After the threading, a standard 20-pitch straight knurl is rolled into the top ridges of the threads to a depth of 0.015 to 0.020 inch.

RATE OF METAL SPRAYING

The rate of spraying may be determined from the time required for a unit length of wire to travel through the gun by applying formula 1. The time required to feed 1 ft of wire through the gun may be calculated by formula 2.

$$M = \frac{3600\ W}{X} \quad (1)$$

$$X = \frac{3600\ W}{M} \quad (2)$$

where

X = time in sec to feed 1 ft of wire
W = weight of wire, lb/ft (see Table 1)
M = metal sprayed, lb/hr
3600 = number of sec per hr

Fig. 2—Tool for cutting grooves in work surface

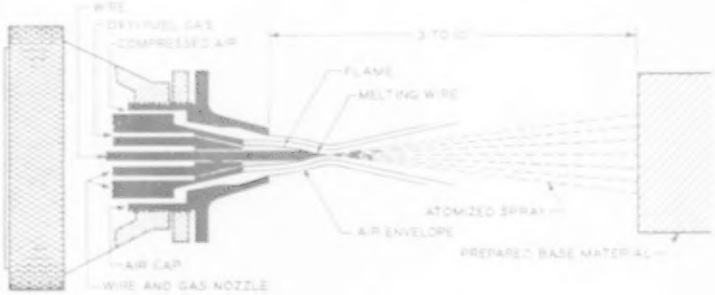

Fig. 3—Schematic diagram of operation of metallizing gun

SPRAYING PROCEDURE

During the spraying operation the gun should be held 3 to 10 in. away from the work, depending upon the equipment and size of wire used. Rate of traverse should be approximately 50 sfpm. The metal may be deposited in either single or multiple passes. If multiple passes are used the feed should be set to provide a coating thickness of 0.005 to 0.010 in. per pass. Thicknesses greater than 0.010 in. may be applied, provided the full thickness of the coating is sprayed in a single pass progressively along the length of surface to be sprayed.

Ends of undercut sections should be sprayed first with the angle of impingement continually varying from about 30° to 60°. Corners should be built up from ¼ to ½ the depth of undercut before proceeding.

After the ends of the undercut sections are sprayed, spraying should be continued with the gun held at an angle of 45° to the work for at least five passes in each direction, in order to deposit metal under each dovetail where the following methods of preparation are used:

Groove and rotary roughening tool or knurling method

Threading and rotary roughening tool or knurling method

Groove and electric-bond method.

The work should then be completed by spraying at right angles to the surface. On all other methods of preparation, after spraying the ends of the undercut sections, the spraying should be continued and completed at right angles to the work.

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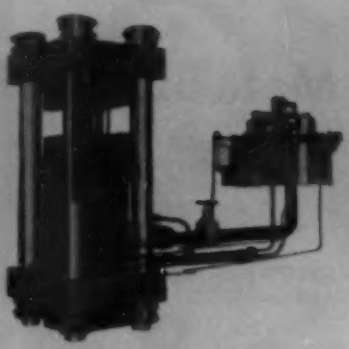

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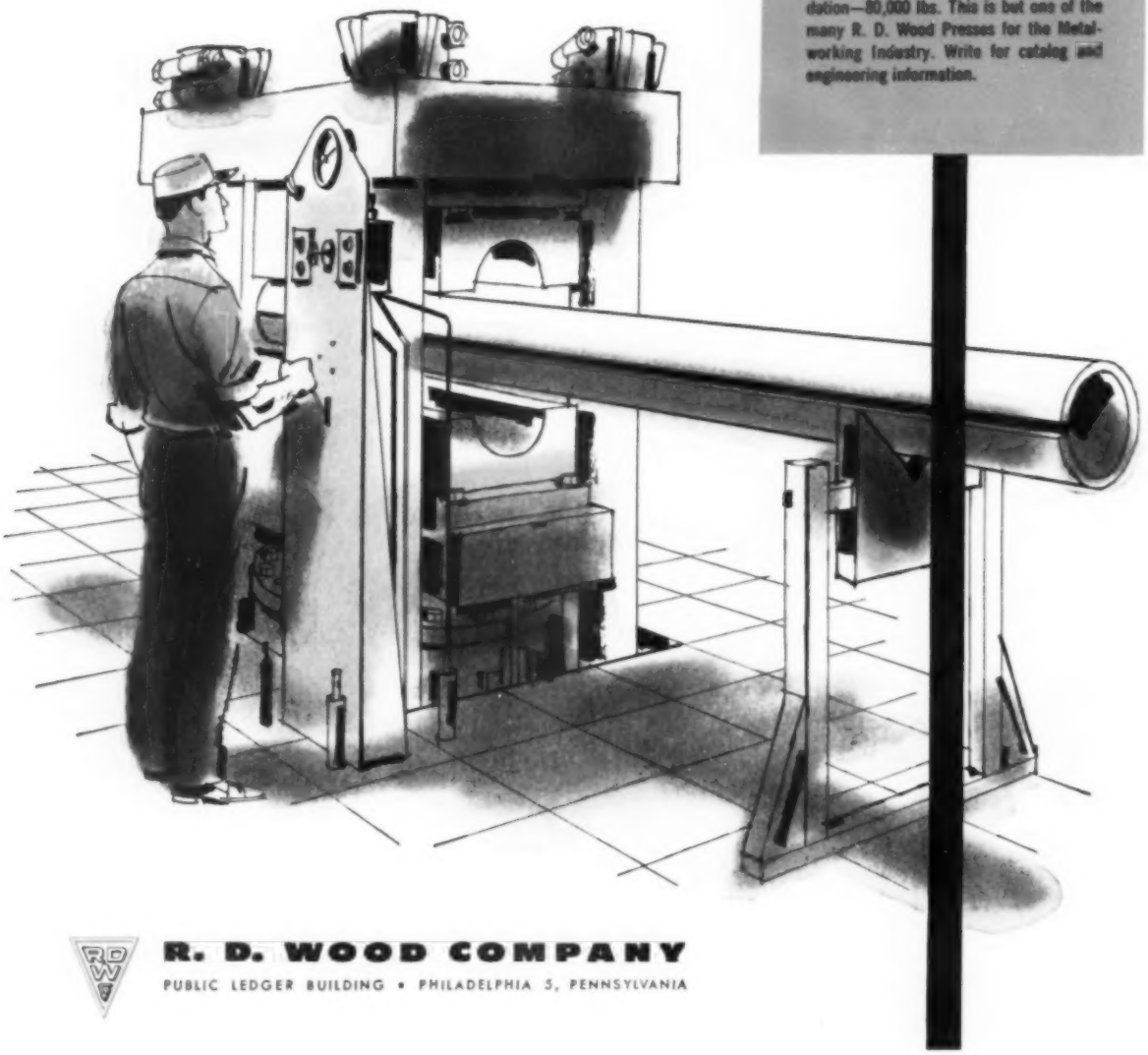


R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

Locking Ability of Hexagon Locknuts

Source: Industrial Fasteners Institute

A prevailing-torque locknut has a self-contained locking means that resists screwing on and off, and that does not depend upon bolt load for locking.

Finished locknuts are made in regular, thin and thick patterns; the heavy semi-finished type in regular and thin patterns. Grades used with bolts are:

Locknut grade	Bolt grade
A	SAE 0, 1 and 2
B	SAE 3 and 5
C	SAE 6, 7 and 8

AXIAL STRENGTH—Test bolts shall have Class 2A threads, and a yield strength in excess of the specified minimum axial strength of the locknuts. If controversy arises, a hardened and ground mandrel (Rockwell C 45) shall be threaded to Class 3 tolerance, except that the major diameter shall be the minimum major diameter with a plus tolerance of 0.002 in.

LOCKING ABILITY—Bolt or mandrel may be lubricated with 520 EP oil. Prevailing torque is the on-torque at first installation. The reading is taken with no load on the bolt, and with the locknut in motion, and with the bolt protruding through the locknut between two and three threads. Break-away torque is the torque to start removal of the locknut.

Maximum Axial Strength of Locknuts, Lb

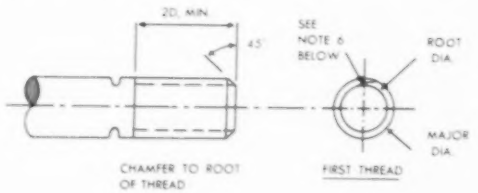
Nom. Size	Grade A		Grade B		Grade C	
	Coarse Thread	Fine Thread	Coarse Thread	Fine Thread	Coarse Thread	Fine Thread
1/4	2,200	2,500	3,800	4,350	4,750	5,450
5/16	3,600	4,000	6,300	6,950	7,850	8,700
3/8	5,350	6,050	9,300	10,550	11,650	13,150
7/16	7,350	8,200	12,750	14,250	15,950	17,800
1/2	9,800	11,050	17,050	19,200	21,300	24,000
9/16	11,650	13,000	21,850	24,350	27,300	30,450
5/8	14,450	16,400	27,100	30,700	33,900	38,400
3/4	21,400	23,850	40,100	44,750	50,100	55,950
7/8	25,400	28,000	53,150	58,550	69,300	76,350
1	33,350	36,450	69,700	76,250	90,900	99,450
1 1/8	41,950	47,100	80,100	89,900	114,450	128,400
1 1/4	53,300	59,000	101,750	112,650	145,350	160,950
1 3/8	63,550	72,350	121,300	138,100	173,250	197,250
1 1/2	77,300	86,950	147,550	166,000	210,750	237,150

On and off Torque with Bolt Protruding 2 to 3 turns

Nom. Size	Prevailing Torque In. -lb., Max.		Breakaway Torque, In. -lb., Min.			
			1st Removal		5th Removal	
	Grade A & B	Grade C	Grade A & B	Grade C	Grade A & B	Grade C
1/4	30	40	5.0	6.0	3.5	4.5
5/16	60	80	8.0	10.5	5.5	7.5
3/8	80	107	12	16	8.5	11.5
7/16	100	133	17	23	12	16
1/2	150	200	22	30	15	20
9/16	200	266	30	40	21	28
5/8	300	400	39	52	27	36
3/4	400	533	58	78	41	54
7/8	600	800	88	117	62	82
1	800	1070	120	160	84	112
1 1/8	900	1200	150	200	105	140
1 1/4	1000	1333	188	250	132	176
1 3/8	1200	1600	220	293	154	205
1 1/2	1350	1800	260	346	182	242

Thread Dimensions for Test Mandrels

Size	Max. 3A +.0000 Major Diam.	Mandrel −.0004 Pitch Diam.	Min. 3A +.0000 Major Diam.	Mandrel −.0000 Pitch Diam.	Tolerance in Lead Plus or Minus	Tolerance on Half Angle of Thd. in Mins. Plus or Minus
1/4-20	.2500	.2175	.2419	.2147	.0003	15
1/4-28	.2500	.2268	.2435	.2243	.0003	15
5/16-18	.3125	.2764	.3038	.2734	.0003	15
5/16-24	.3125	.2854	.3053	.2827	.0003	15
3/8-16	.3750	.3344	.3656	.3311	.0003	15
3/8-24	.3750	.3479	.3678	.3450	.0003	15
7/16-14	.4375	.3911	.4272	.3876	.0003	15
7/16-20	.4375	.4050	.4294	.4019	.0003	15
1/2-13	.5000	.4500	.4891	.4463	.0003	15
1/2-20	.5000	.4675	.4919	.4643	.0003	15
9/16-12	.5625	.5084	.5511	.5045	.0003	15
9/16-18	.5625	.5264	.5538	.5230	.0003	10
5/8-11	.6250	.5660	.6129	.5619	.0003	15
5/8-18	.6250	.5889	.6163	.5854	.0003	10
3/4-10	.7500	.6850	.7371	.6806	.0003	10
3/4-16	.7500	.7094	.7406	.7056	.0003	10
7/8-9	.8750	.8028	.8611	.7981	.0003	10
7/8-14	.8750	.8286	.8647	.8245	.0003	10
1-8	1.0000	.9188	.9850	.9137	.0003	10
1-12	1.0000	.9459	.9886	.9415	.0003	10
1-14	1.0000	.9536	.9897	.9494	.0003	10
1 1/8-7	1.1250	1.0322	1.086	1.0268	.0003	10
1 1/8-12	1.1250	1.0709	1.1136	1.0664	.0003	10
1 1/4-7	1.2500	1.1572	1.2336	1.1517	.0003	10
1 1/4-12	1.2500	1.1959	1.2386	1.1913	.0003	10
1 3/8-6	1.3750	1.2607	1.3568	1.2607	.0003	10
1 3/8-12	1.3750	1.3209	1.3636	1.3162	.0003	10
1 1/2-6	1.5000	1.3917	1.4818	1.3856	.0003	10
1 1/2-12	1.5000	1.4459	1.4886	1.4411	.0003	10



TEST MANDREL

RECOMMENDED DETAILS:

1. *Material:* Steel.
2. *Hardness:* Heat treated to Rockwell C60 to 64.
3. *Threads:* The thread form shall conform to that shown in American Standard B1. 1—1949, "Unified and American Threads."
4. *Surface Roughness:* 20 micro-inch maximum.
5. *Finish:* Vapor blast or liquid hone in equipment furnished by the Vapor Blast Manufacturing Co., 3027 West Atkinson Ave, Milwaukee, using a 1250 mesh abrasive to produce a smooth uniform color. Any other finish that is equivalent will be acceptable.
6. The mandrel end shall have a 45° chamfer extending below the root diameter. The lead thread of the mandrel shall be modified so as not to remove metal or the locking element from the nut in torquing.

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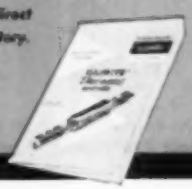

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Talking Shop...

Word Wanted

OLD-TIME machinists generally used soda water or lard oil to cool or lubricate the work. And they called them just that, "soda water" or "lard oil." In more recent years we have developed a wide range of new products with improved cooling and lubricating properties. The commonly adopted name for these was "coolants," but this did not adequately describe their function because, as often as not, lubrication and anti-weld properties were more important than cooling. A strong effort has been made to change "coolant" to "cutting fluid," but this has been only partially successful, and it's inaccurate anyhow, because the material may not be a fluid. It can equally well be a gas or a solid. And even the word "cutting" is open to argument because they certainly don't do any cutting. Maybe we need a brand new word to describe the function and nature of these materials that will encompass all the various fluids, solids, and gases used to assist and improve metal-cutting operations. Dr. Dyer, of Behr-Manning Co, suggests "grinding aids," but that will not fit other machining operations. Got any ideas?

Niobium Note

YOU MAY remember our recent item about the history of the metal with two names—columbium and niobium—and the decision to standardize on niobium. Now comes a footnote in the *SAE Journal* to tell about the salesman for alloy steels who called to tell his client that a certain alloy was now being made with niobium instead of columbium. With tongue in cheek, the client's metallurgists asked why. It doesn't really make much difference in the product, the salesman admitted, but columbium is scarce and niobium is plentiful.

Flatter Plate

THE GROWING popularity of tooling plate made of magnesium may take a spurt with the promise that guaranteed flatness is within 0.020 in. in 6 ft, compared with the former 0.030 in. Dow Chemical reports that typical pieces are running from 0.010 to 0.020 in. deviation.

Reliability Emphasis

YOU FIND more and more emphasis being put on the need for reliability. The need reaches its highest point on the launching pads at Cape Canaveral, but it crops up with persistence in auto showrooms and home kitchens. Reliability starts with the product designer, of course, but the key point is in the shop and the key man is the production man. People are the key to the problem and it is essential to instill a new sense of reliability consciousness in every man in the plant.

These points come to mind because we hear that the Navy Bureau of Ordnance plans a series of nine films on the reliability concept. Aim of the films is to alert everyone concerned with designing, producing, testing, and operating naval equipment to the urgency of this concept. If you have ideas on the points they should cover, the Navy will welcome suggestions. You may also want to borrow the films when they are completed.

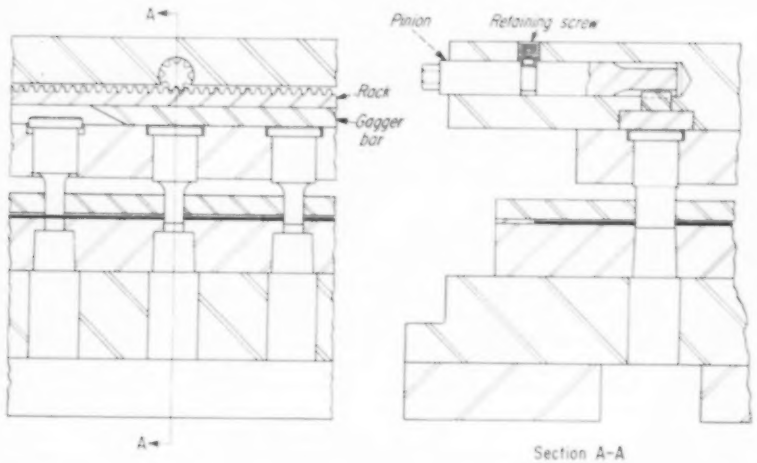
Decent Burial

THE CONTINUED use of the traditional term "indirect costs" to cover everything but manual labor creates an organizational posture tolerant to "direct" functions and highly critical of "indirect" functions. That comment is by Frank Squires, director of quality control, Topp Manufacturing Co, Los Angeles. He puts the point, which we've been bringing up for years, better than we've ever heard it. Don't be misled by this terminology. In fact, maybe we should give the term "indirect" costs a decent burial and forget it forever. Today, how much of "indirect" cost actually is?

Rack Corrosion

RACKS USED in plating or anodizing would seem a logical place to try titanium. Here is some data on a company that did. Reynolds Metals has automatic anodizing equipment for automotive parts. Average life of racks was 6 days. Working with Mallory-Sharon, Reynolds developed a rack made of aluminum and rubber-coated, with titanium tips and holding fixtures. In one design the fixtures are made of 0.071 gage titanium sheet and are 1½ in. wide and 4 in. long. Fixtures are riveted or bolted to the rack. Average life: 120 days.

Practical Ideas...



Positive Floating-Punch Arrangement Employs Pinion and Gear Rack

When many parts of similar design are to be produced in piercing dies, cost of tooling will be reduced if it can be arranged to run all parts in one die. Where the size of the holes and the hole pattern are alike, except for the difference of the number of holes, cost reduction can be achieved if provisions are made to inactivate some punches.

To exclude certain punches generally means that the die must be taken from the press, disassembled in the toolroom, to remove the punches, then the die is reassembled and reset in the press. While this method may appear to be adequate for low production, it is costly and time-consuming for medium and high-production runs.

For a die that requires frequent changes of hole patterns, the illustrated floating or gag-punch method has proven successful. It has a sliding bar, activated by a gear rack and pinion, which can either back up the punches for piercing, or make them inoperative. Punches are engaged or disengaged without disturbing the die in the press. The bar has positive action and is fast and easy to operate together with an unusually long travel.

The rack and pinion, shown in the drawing are No. 12 pitch, standard purchased items. The pinion was modified in length and a groove was added to receive a dog-point setscrew. The exposed end of the pinion shaft was machined hexagonal to fit a wrench for rotating the pinion.

The rack was secured to the gagger bar, making the two parts an integral unit. The groove milled into the punch-holder provided a sliding fit with clearance for the top of the rack. A blind hole was drilled and reamed from the front edge of the punch-holder to receive the pinion.

Consequently, to move the gagger bar for engaging or disengaging punches, the pinion is revolved in either direction as required.

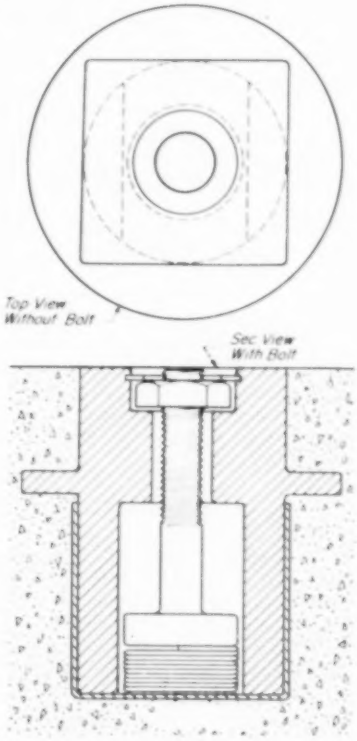
Walter L Stein, Kenosha, Wis

Incased Anchoring Bolts Are Retractable

In answer to the article by H K Lee entitled, "Wanted: Improved anchoring Method" (*AM*—Dec 2 1957 p 105), I would like to submit a description of the method we use. The initial cost will be slightly higher than a plain hooked bolt. But in a plant where machinery must be transferred and later replaced, the extra cost is trivial.

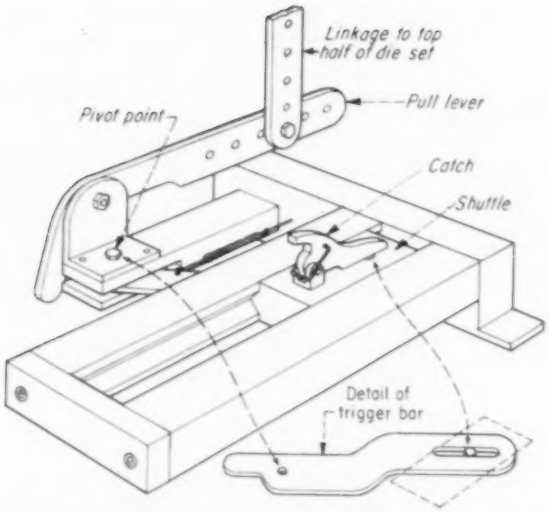
The sketch illustrates how an anchoring bolt is retracted in its housing. In this state it offers no obstruction to floor traffic and is at the same time protected against damage.

The most economical way to produce the housings is by casting them. Then the only machining necessary is cutting a snap-ring groove in the top ID. A shell is used over the bottom end. This serves two purposes; it prevents concrete from entering the housing, when the housing is cast into the floor, and it retains a light compression spring.



To complete the assembly, a square-headed bolt, a hexagonal nut, and a snap ring are required. To make the bolt extend, all that has to be done is to hold back on the bolt while the snap ring is removed. When the snap ring comes out, up pops the bolt ready for use. Coating the internal parts with grease will protect them from rust.

R Allard, Montreal, Canada



Automatic Press Feed Attachment

We had a job lot of several thousand parts to be pierced and blanked in a progressive die. The strip material came to us in large rolls which we mounted on a rack to permit feeding directly into the die. To make production fully automatic, a feed attachment was needed.

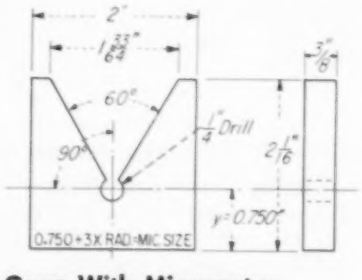
The illustrated mechanism fills the bill well. Its feed stroke is easily adjustable by the many holes in the pull lever and the linkage to the top half of the die. A turnbuckle at the upper end provides fine adjustment to this linkage.

After hand feeding the strip for the first few parts, the spring loaded catch on the shuttle takes over. From this point on the stock is advanced on each upstroke of the ram.

Method of securing the attachment is intentionally omitted from the drawings. One of the reasons for this is to avoid confusion, the other is that the builder may want to attach it to the die block as an integral part of the die. Or he may want it on the die shoe so it may be used with other dies mounted on the same shoe. In either case, the assembly mounts beneath the stock level deep enough to allow only the catch to reach through the holes in the scrap material.

On the upstroke of the ram the horizontal pull lever actuates a trigger bar. This in turn slides the catch-carrying shuttle away from the die, advancing the stock. A tension spring, attached to the trigger bar, returns the shuttle to its starting position on the down stroke of the die.

R. C. Gordon, Bangalore, India

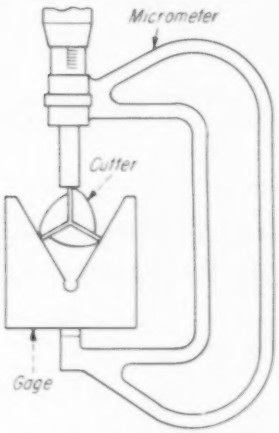


Gage With Micrometer Finds Three-Flute Tool Dia

We had purchased a batch of unground three-fluted reamers and were grinding them to our special sizes when this gage was designed. It did a good job then, and is still as valuable when a three-fluted reamer or end mill must be measured.

As the sketch shows, the gage is used in conjunction with an outside micrometer. And because both hands are needed to hold the gage and to adjust the micrometer, the tool must be held in a collet, chuck, or vise. Then, to find the high spot, a slight rocking motion with the mike and gage is necessary.

A lasting gage is made from oil-hardening ground stock. We selected a ⅜ in. piece 2 in. wide by 2 1/16 in. long. These dimensions may vary without affecting the accuracy of the gage. The critical dimensions are: The angles, which are 30° on each side of the centerline; the distance between the



base; and the vertex of the angles. And, for layout work, the perpendicular centerline.

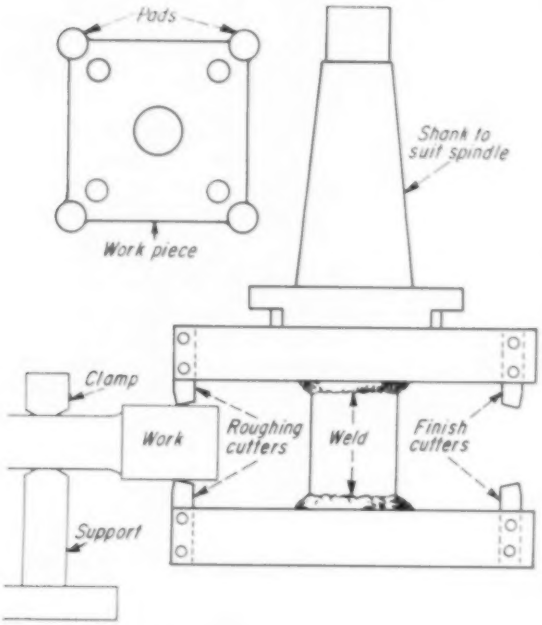
After preliminary machining, the gage is hardened and ground all over. If careful attention is given to the squareness of the edges in relation to each other, the angles will be easier to set up for grinding.

The formula for determining the diameter of a three-fluted tool is as follows: The dimension Y is subtracted from size over tool and block. The remainder is divided by 3, which equals the radius of the tool. This is then multipled by 2 to get the diameter.

In reverse, as we have stamped on the gage, the formula is: 0.750 in. + 3x radius-micrometer setting. The solution found by this formula is employed when the gage is checked with a known diameter.

Herb Reichert, Burlington, Wash

Practical Ideas...



Dual Facing Tool Cuts Production Time In Half

Having to face four corner pads on each side of 14,000 castings loomed as a time-consuming project. The pads were 2½ in. in diameter, and the center-to-center distances between them were 22 x 22½ in. This size made the castings awkward to handle in a lathe; not to mention a very slow process of first facing one side and then turning them around to face the opposite side.

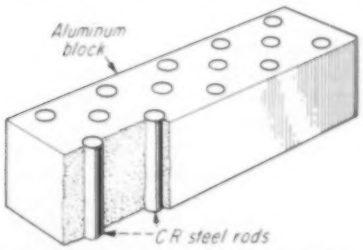
Our best bet was mounting them on a rotary table and employing the dual-face flycutter shown. This method not only cut the production time in half compared to standard flycutters or facing mills, but it also assured parallelism and flatness.

Since only one setup for each casting was necessary, more time was at first devoted to that operation. But once the operator got the hang of it, clamping was fast and accurate. After the work had been properly located and secured on the rotary table, it was fed into the cutter rotated in the vertical-head spindle.

Two sets of cutting tools, rough and finish, cut both faces of a pad with one pass. The roughing tools precede the finishing tools by ¼ in. That is, the radius at which the roughing tools are set is ¼ in. greater than the radius of the finishing tools. Depth of roughing cut is adjusted to leave 1/64 in. for the finishing cutters.

The shank and arbor can be turned from machine steel, or an old usable mill arbor can be altered to receive the cutter beams. These members are welded to the arbor as shown; each being provided with squared holes to receive toolbits.

Joseph Bonnafe, Wilmington, Mass



Economy Magnetic Parallels

Every shop having a surface grinder has undoubtedly one or more sets of magnetic parallels. However, situations may sometimes develop where these parallels are either too low or not long enough. When this happens, shopmade parallels (one of which is illustrated) will often be the solution to the problem.

A non-magnetic material must be employed in the body of these parallels. I made mine from aluminum bar stock. After having cut my stock to approximate sizes, I drilled a series of through holes to suit some CR steel rod we had.

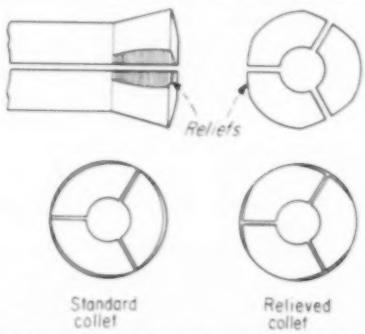
The rod was then cut into pieces fully as long as the height of the parallel. When all holes had been plugged by these rods, overall machining was done, finishing off by grinding both bearing surfaces parallel.

Howard Levy, Brooklyn, N Y

Collet Modification Permits Gripping Undersize Work

It generally isn't advisable to tamper with precision tools. That rule applies to many workholding devices and particularly collets. However, sometimes a job will come along which includes diameters slightly smaller than the nearest collet size.

Gripping undersize work in a standard collet is harmful to the spindle bore and should be avoided. How a collet reacts under these conditions is shown in the sketch. The corners on each side of the slits are the only points in contact with the bore. Accuracy is then affected, and the spindle takes unnecessary abuse.



Both of these disadvantages are easily eliminated by grinding a relief on each side of the slits. These reliefs should be no wider than approximately 1/5 of the periphery between two slits, and about 0.010-in. deep. Their length should extend across the full width of the taper.

This modification will not impare the usefulness or accuracy of the collet for normal jobs.

H J Gerber, Stillwater, Okla

HJALMAR DAHL
Upplands Vasby, Sweden

won **$25** in addition to regular payment for his idea:

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in the Dec 30, 1957 issue

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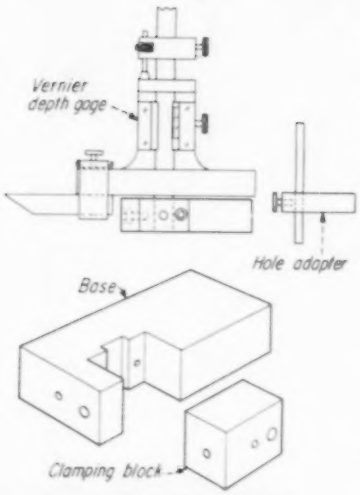


Base Doubles Usefulness of Vernier Depth Gage

The above sketch shows a base I recently made for my depth gage. With this base, and a scriber, it can be used as a vernier height gage for small layout work. When the adapter (also shown) is clamped on the beam, the gage can be used to check depths of small holes and narrow slots.

Care in machining the slot that receives the gage blade, is the only close work involved. Besides being machined square with the base, the slot should present a slip fit to the blade. The clamping block fills the rest of the cutout in the side of the base.

Two small socket head cap screws are used to hold the clamping block in place. One enters from the front of the base and the other through the block on the side. A pair of headless setscrews with brass plugs clamp the blade edgewise and sidewise.

Outer dimensions are up to each individual's preference. But I found a base, 2-in. long, 1-in. wide and ½-in. thick, adequate and small enough to stick into the toolchest.

After all machining has been completed the base and clamping block are surface ground together. The scriber and its clamp are made to suit the gage beam.

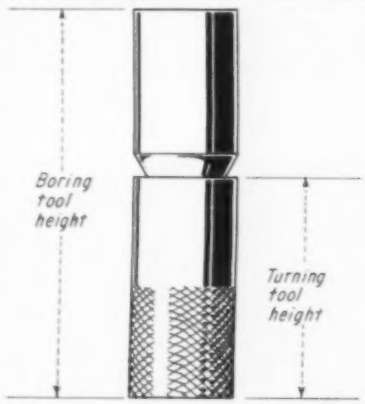
John Willemsen, Woodland Hills, Calif

Gage Sets Height of Lathe Tools

Turning or boring tools give best results when they are set at their proper height. A turning tool set too high will dig into the work, while one set too low will be pushed back. The reverse is true for a boring tool; when too low it will dig in, and when too high it will be forced away.

Operations like threading, taper turning, or grooving require proper tool height if cross-feed calibrations are to be relied on. Parting tools need also be correctly positioned for good results. Waste of time, and sometimes material is the unavoidable result of guesswork.

To simplify the job of setting these tools at their correct height, I made the gage bar shown. It can



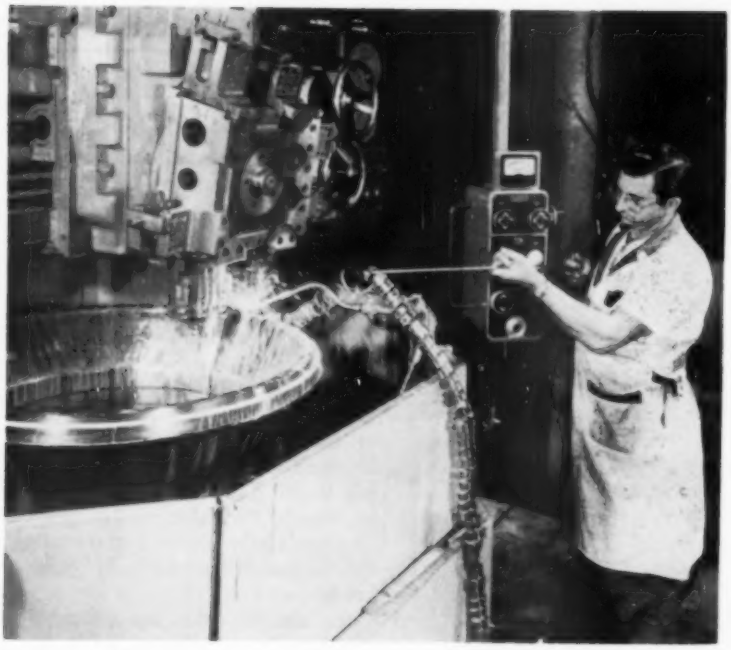
be used, seated on the compound rest, to set turning tools; or on the lathe bed to set the height of the tool at the extended end of a boring bar.

The gage is nothing but a length of 1¼-in. dia C R S bar stock. It is faced off at both ends to a height corresponding to the distance between bed and the horizontal center of the lathe. The height from the turning tool to the compound rest is scribed on the gage and then made better legible by an angular groove, turned in the lathe. Knurling the bottom end of the gage makes it easier to grip, as well as distinguishing it from ordinary material.

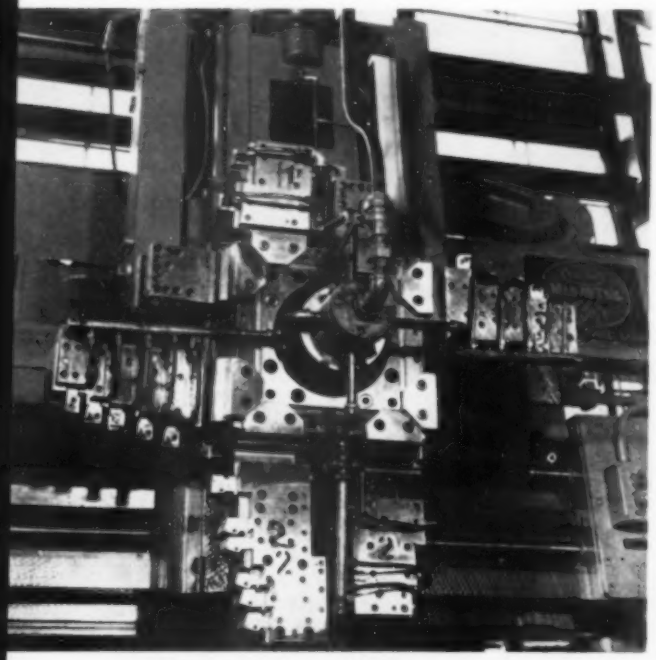
John L Murphy, Conshohocken, Penna

SHOP SHOTS at Lycoming

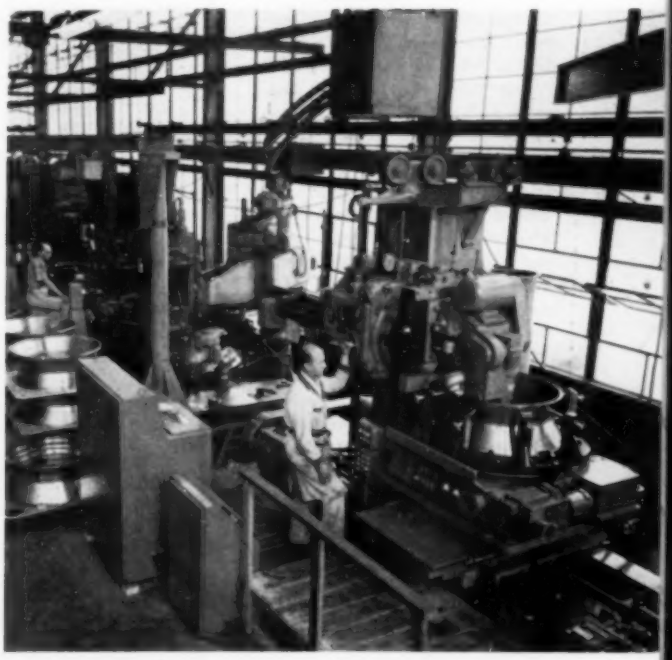
Jet engine fabrication makes special machines and special techniques the order of the day rather than the exception. Under sub-contract from Ford Motor Co, the Lycoming Div of Avco Corp is producing turbine case assemblies for the J57 P&W engine. The job, difficult even by today's standards, is made easier by combining many of the machining operations and by some clever tooling techniques



Outer turbine case . . .
arrives at plant as a 850-lb rough forging. It is hogged down on this Bullard Man-Au-Trol vertical lathe until finished piece weighs only 90 lb. The complete assembly consists of two basic parts—this outer case and an inner case made from a rolled flash butt-welded ring

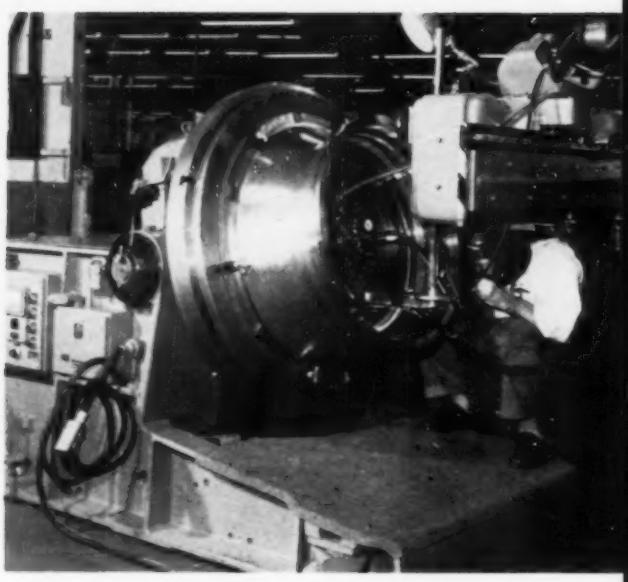


"Christmas-tree" tool setup . . .
on 42-in. vertical lathe finish bores and finish faces one end of turbine-case weldment. In two operations, the 24 tools produce 64 finish dimensions, all accurate to within 0.001 in. Cast-iron-grade carbide tools are required because the material (ASM 5736 alloy), though relatively soft, is highly abrasive

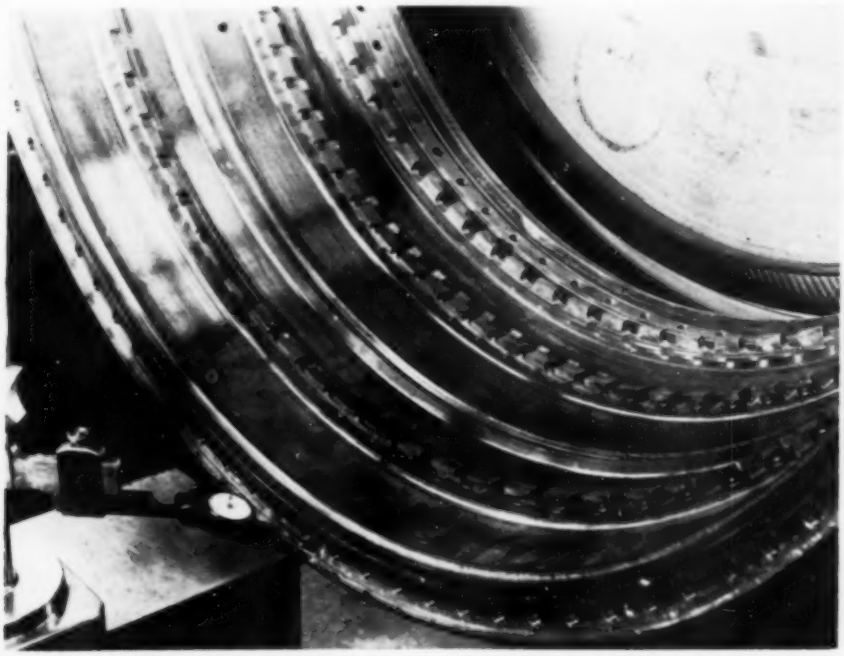


Three rows of slots . . .
two of them within 45 seconds of true angular position (approx 0.003 in.), are milled on Forge de Gilly boring mill. To do the job, the mill was equipped with a Pratt & Whitney tape-controlled rotary indexing table, a special milling head, an automatic hydraulic feed unit, and special workholding fixtures

Overhung drilling setup . . .
drills 44 vent holes, 3/32 in. dia by ⅝ in. deep. Setup, nicknamed "Nike," uses a rotary indexing table that floats on a cushion of air while turning. Other automatic drilling units drill 216 flange holes and drill and ream 140 blind holes

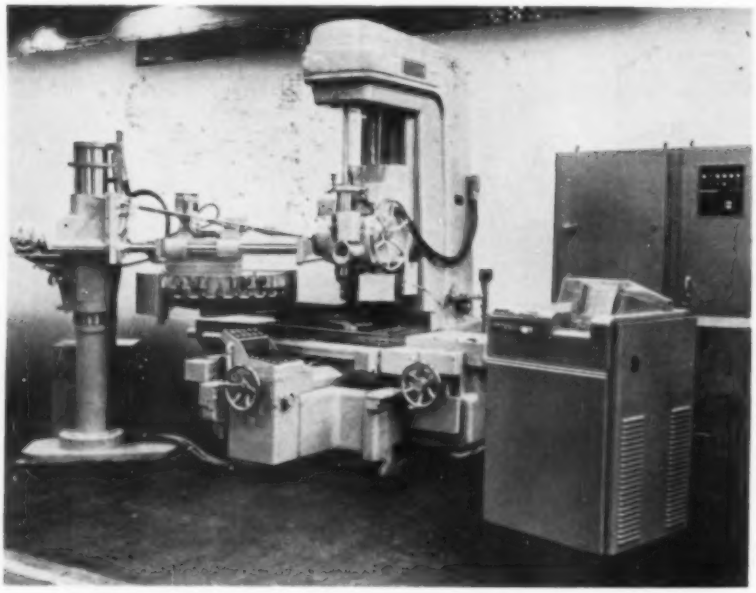


Semi-automatic welding machine . . .
welds inner sheet-metal ring to inside of turbine casing. Presently tooled for production of approximately 80 assemblies a month, Lycoming has the capacity to turn out about twice that number



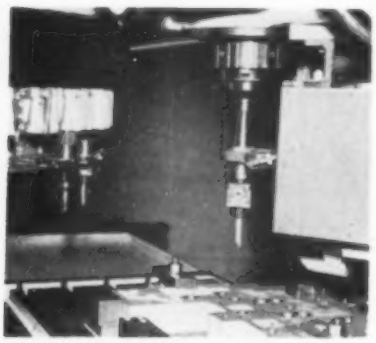
Completed case weldment . . .
shows the "specialness" of many of the machining operations. Combining some of the operations and making many of them automatic has kept the scrap rate low. Rejection rate to the customer has been held to less than 2%

New Shop Equipment



Numerically-Controlled Jig Borer Selects Its Own Tools

Believed to be the first fully mechanized jig borer, the Fosdick automatic jig borer performs all operations on a given part without attention from an operator. Machine functions, programmed by numerical control using IBM cards, include choice of 30 or more tools, positioning of holes, spindle speeds and feeds, hole depth and spindle head height. IBM Corp uses the machine in the production of side frames for its own data processing equipment. Thirty operations are performed on each part. Total hole location error in the 16 x 18-in. side frames has never exceeded 0.0004 in.



AUTOMATIC TOOL CHANGER selects the programmed tool from rack and positions it under spindle

Automatic Tool Selection

Automatic tool selection equipment is faster than manual operation and can be done simultaneously with other machine functions. Thirty tools are carried in a disk which can be indexed to a pre-selected position under card control. When the tool is positioned under the spindle, an air-operated wrench closes on the toolholder. After the disk retracts, the spindle feeds down while rotating slowly and engages the thread at the end of the toolholder shank. At a predetermined locking torque, the wrench opens and the spindle feeds down in accordance with the program. The tool is removed by the same steps in reverse sequence. Tool storage unit is floor-mounted separate from the machine.

Hole Depth Control

Hole depth is controlled automatically. Spindle rapid traverse down is controlled by a photoelectric unit. As the tool feeds down it passes through a beam of light. From this point, it continues to traverse a predetermined distance and then shifts into cutting rate feed. A piezoelectric crystal mounted on the workholding fixture picks up the characteristic vibration of the tool entering the work, and this actuates the depth control system. Measurement is controlled by a shaft digitizer geared to the downfeed spindle drive; pulses are obtained for each 0.001 in. of downfeed.

Numerical control of spindle head height assures that head will always be at the correct height so that even workpieces with holes surfaces at extreme differences in elevation can be worked automatically.

Measuring System

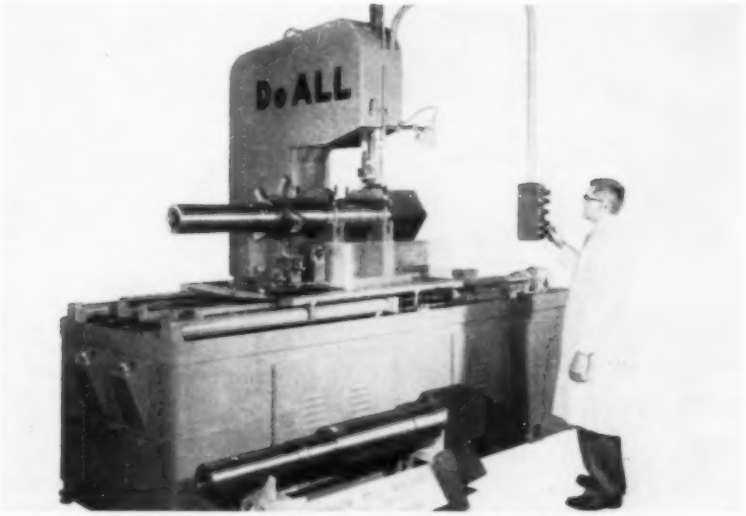
The basic machine is a Fosmatic 54P jig borer. It features 16 spindle speeds from 30 to 1800 rpm and eight feed rates from 0.0005 to 0.010 ipr. Speeds and feeds are controlled by electromagnetic clutches. Measurement of table position along X and Y coordinates is achieved by lining up series of end-measuring gages. There are four gages in even tens of inches, ten in inches, ten in tenths of inches and so on down to 0.0001-in. increments. Gages are selected by motor-driven drum dials and are positioned end to end to provide required measurement for the part.

Movement of table stacks the gages and moves them against a limit switch. At this point, the table is stopped, the leadscrew is relieved slightly and the table is clamped. Accuracy is ± 0.0001 in. Complete data for a single hole is stored on one card; each part is programmed in a "deck" of cards.

Among the advantages claimed for this automatic system are the elimination of practically all setup time at the machine (planning is normally done in engineering department); considerably shorter machining cycles; reduced labor costs; improved quality; and reduction of over-all manufacturing costs. In addition to the savings in direct machining costs, shorter setup times permit inventory savings due to reductions in optimum manufacturing orders.

Fosdick Machine Tool Co, Cincinnati 23, Ohio

Materials and Parts



Band Mill Rips Heavy Plate, Trims Heavy Castings, Refaces Dies

Model 26-5 band mill rips heavy plate, shanks or refaces forging dies, trims heavy castings or slabs massive billets, and is reported to do so in a fraction of the time and at a fraction of the cost involved with more costly machine tools. Because the blade reduces only a thin slice of material to chips, the machine makes for rapid cutting and low power consumption.

Machine has a capacity of 24 x 26 in. and a variable band speed of 50 to 5000 fpm. It features a fluid-driven ball screw feed. Operating controls are grouped on an adjustable pendant. Solenoid valves control variable table feed and rapid table traverse. A meter indicates band speed in fpm or table feed in ipm. For heavy work or for cutting high alloys feeds as low as 0.030 ipm are available. Hydraulic cylinders provide rapid traverse and feeds up to 8 fpm.

The recirculating-type cooling system has provision for both settling and filtering. The coolant nozzle in the form of a shroud surrounding the blade directs a heavy flow into the cutting area continuously during cut.

If greater capacity is required, the machine can also be made available with additional work height, table load capacity and stroke as required.

DoAll Co, Des Plaines, Ill

Abrasive Wheel Cutoff Saw Handles Ferrous Metals

Model R-1000-A cutoff saw is designed for high speed, accurate cutting of small bars, shapes, tubing and pipe of steel, alloys or other ferrous metals. A conversion unit permits this machine to handle both ferrous and nonferrous metals.

Removable guard permits easy changing of wheels. An opening in the table allows short pieces to drop into a container below the table. The machine has a standard-make motor, accurate work stop, a quick action vise, and is designed so that the operator has maximum "feel" at all times. Literature available on request.

Backus Machine Works, Carlstadt, NJ

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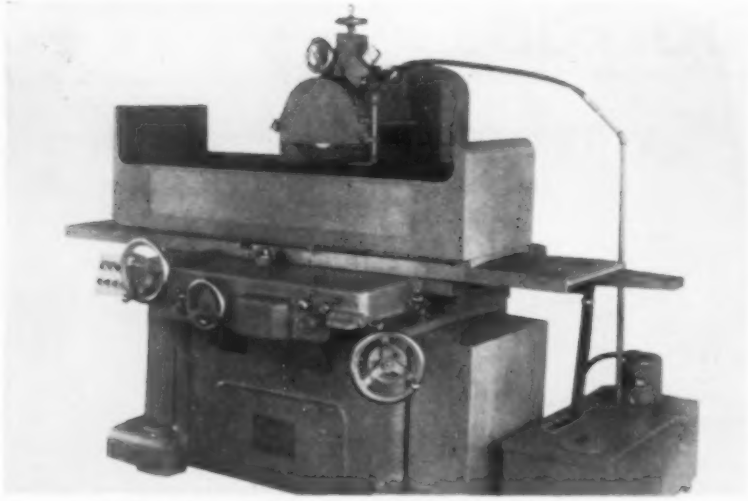


Covel Hydraulic Surface Grinder Has 16 x 36-in. Capacity

Covel No. 80 will grind work 16 x 36 x 18½ in. high under a 14-in. wheel. Among its features are sealed hydraulic oil tank mounted outside at right end of machine; hydraulic pump, motor, and relief valve mounted on platform as a unit that can be easily removed from front of machine when maintenance is required. Saddle moves on two flat ways. Center guide with hardened steel tapered gib is provided to compensate for any wear.

Table speeds are 10 to 90 fpm. Adjustable automatic hydraulic cross feed for table is from 0.005 to 0.300 in. at each reverse of table.

Covel Manufacturing Co, Benton Harbor, Mich

Metal-Cutting Bandsaw Provides Four Speeds to 210 fpm

Model E bandsaw has a capacity of 11 x 20 in., will cut 11-in. rounds, 10-in. pipe, and will cut 6-in. pipe on a 45° angle. It has four speeds—42, 79, 134 and 210 sfpm. The controlled hydraulic system in the balanced head maintains a constant, equalized pressure on the blade throughout the cut. An improved, quick-acting vise with swivel locking pin assures a tight grip on workpiece.

Machine uses all standard bandsaw blades from 11 ft 5 in. to 12 ft 1 in. in length, 0.032 x ¾ in. wide. It weighs approximately 850 lb, requires a floor space of 72 x 26 in., and is powered by a ¾-hp motor. An adjustable stock stand and casters are available as optional equipment. Bulletin 158 available.

Cutron Mfg Co, 503 N Ave U, Lubbock, Texas

Electrolytic Grinder Grinds Chipbreakers and Cup Wheels

Designed for metalworking shops with medium volume and medium-duty work, and for tool grinding operations in which a dual-purpose machine can be used to advantage, the CME-6 machine, built by Hammond Machinery Builders, Kalamazoo, Mich, is equipped to grind both chipbreakers and cup wheels. The Anocut 150-amp electrolytic power supply is located at base of machine. Controls are set at eye level and can be swiveled to face whichever side of the machine is being used.

The chipbreaker end is equipped with a vise for tools up to 2½ in. wide. Max carriage stroke is 7 in. The cup wheel end has an 8½ x 14½-in. table with a compound protractor. Angular adjustment is from 10° above to 25° below horizontal.

A MistKolector, with 16-gal coolant tank underneath, is located alongside the machine. The machine is not suitable for grinding very large single point tools nor is the output sufficient for grinding large areas of steel shank. Both wheels should not be used simultaneously.

Wheels are not included with the machine. The chipbreaker grinding wheel is 6 in. dia, 3/32 to ½ in. thick, with a 1¼ in. hole. Cup wheel end takes a wheel 6 in. dia, 1¼-in. center hole, with four 17/64-in.-dia countersunk holes on 3¼-in.-dia bolt circle. Literature available.

Anocut Engineering Co, 631 West Washington Blvd, Chicago 6, Ill

Device Converts Standard Drillpress Into High Speed Machine

Attachment known as Drillspeeder has a maximum speed of 30,000 rpm. It is adaptable to any standard drillpress spindle, quickly converting it into a high speed drilling machine. Unit permits the use of solid carbide drills and reamers and is said to be suited for high speed drilling of small holes.

The gear ratio is 4 to 1. The chuck capacity is from No. 80 to 5/32 in. Other features include heat treated steel spindle; pre-loaded, shielded ball bearings; and heat treated gears.

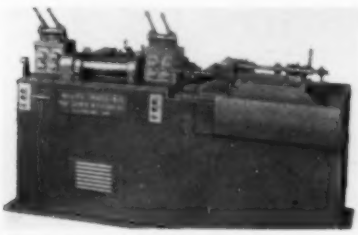
Jarvis Corp, Middletown, Conn

New Avey Drilling Machines Provide Automatic Cycle

Automatic cycle drilling machine is available in three models, 2 to 5 hp, with No. 2, 3, or 4 Morse taper. Units are furnished with variable speed or six adjustable speeds and four standard rates of feed.

Machine cycle is automatic in that when the power feed spindle is engaged, the quill under rapid traverse feeds down to a predetermined adjustable depth, whereupon the regular feed rate takes over and feeds to the desired depth with rapid traverse return. This feature lends itself to automatic setups using dial tables or through-type transfer fixtures for semi-production or high production work. When automatic cycle is not being used, unit can be operated as a regular hand or power feed drilling machine.

Motch & Merryweather Machinery Co, Avey Div, Cincinnati 1, Ohio

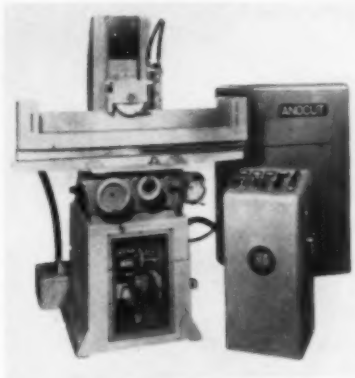


Wire Straightener-Cutter Incorporates Traveling Cutoff

No. 4FH Travel-Cut for high-speed cutting of welding rod and similar short items has 3/32 to ¼-in.-dia-capacity in mild steel, 3/16-in. max in high carbon, alloy, and stainless.

Feed speeds from 75 to 520 fpm are possible through use of a positive-action, high-speed shear actuating mechanism. This new cutoff which travels with the rod and cuts while in motion is suited for either long or short lengths. With an air clutch, perfect synchronization of the cutoff, wire speeds, and maximum accuracy is attained in the range of 125 to 395 fpm. Without clutch, higher rates of automatic production are practicable.

Lewis Machine Co, 3441 E 76th St, Cleveland 27, Ohio



Electrolytic Grinder Provides Table Speeds of ½ to 11 ipm

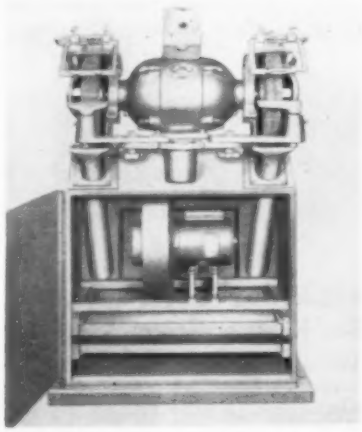
Model 618 electrolytic grinder is designed for grinding and stock removal of carbides, hardened steels, heat sensitive materials, and for grinding parts unsuited to normal grinding procedures. The machine uses the basic Anocut 300-amp unit as its electrolytic power supply.

The current brushes on the spindle are completely enclosed to eliminate dust. To insulate the spindle from the machine, a layer of glass fiber is bonded to the barrel of the spindle and ground to a size that enables the spindle to fit any standard Reid head.

Table speeds range from ½ to 11 ipm. The 20:1 variable-speed dc drive is potentiometer controlled to provide sensitive adjustment. Both the Anocut controls and the grinder controls are located on a single console-type control unit. As a safety factor, isolation transformers for the spindle practically eliminate accident from electrical discharge.

Overload on the spindle automatically stops the machine. This emergency stop can also be operated manually. An ammeter indicates spindle load. Changeover from electrolytic to standard grinding takes but a few seconds. All of the Model 618 standard features (Dec 3 '56, p182) are included.

Reid Bros Co, Inc, Beverly, Mass



General-Purpose Grinder Offered In 1, 2 and 3-hp Models

Redesigned to include a dust collector in its base, the Model 500 general-purpose grinder is available in 1, 2 and 3-hp models. Grinder features a totally enclosed motor, push-button starter with overload protection, enclosed adjustable wheel guards, tool tray, and a lift-out water pot.

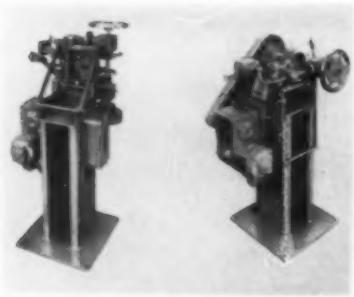
Polluted air is drawn into a filter cabinet and directed downward to remove the heavy particles. The air is then directed upward through a glass fiber pad and returned to the room. Suction fan and the ¾-hp motor operate in clean air. Unit is rated at 1000 cfm at 4 in. pressure. Machine is 32½ in. wide and only 20 in. deep.

U S Electrical Tool Co., 3640 Llewellyn St, Cincinnati 25, Ohio

Chatter-Free Boring Bar Has Interchangeable Heads

Vi-Bra-Damp construction incorporates a cavity within the bar which has been shot-loaded to eliminate all vibration and chatter. Bars and interchangeable tool heads are available in sizes and styles for all boring machines. Guaranteed repeat accuracies of 0.0001 in. are claimed. Positive locking cam, loosened with ¼ turn of an Allen wrench, permits rapid head changes.

Fry Tool Mfg Co, Eaton, Ohio

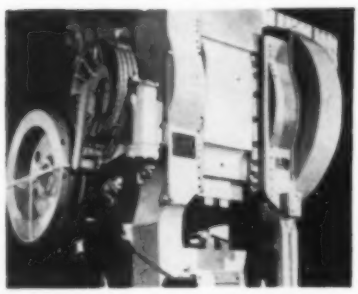


4-Slide Wire Forming Machine Has Flip-Top Vertical Swing Bed

Model 00 automatic wire former incorporates a flip-top vertical-swing bed which permits raising the machine to vertical positions for tooling, adjustment, and maintenance. Horizontal position is used when unit is in operation.

Machine also provides increased feed length up to 4¼ in. with ample tooling areas at each position. New pedestal base, more compact (less than 2½ x 2½-ft floor space), includes a shelf under the machine which may be used as a finished work receptacle.

Baird Machine Co, Stratford, Conn

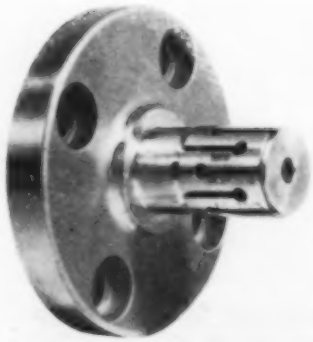


Erie Mechanical Forging Press Incorporates New Features

Over-all press height of newly designed 2500-ton unit is 11 ft 3 in., a reduction of 3 ft below that of present models. This is accomplished by means of a scotch yoke (sliding block) to transmit pressure from the eccentric shaft to the ram. Yoke also provides a larger bearing area, increases rigidity of press, and permits elimination of the pitman and ram pin. Front columns are spread and working area moved forward to give operators 8 in. more clearance for manipulating the work in and out of the die. Ram guiding has been improved by auxiliary guides provided at bottom of stroke.

Circulating flood lubrication is provided for the main bearings and the scotch yoke is operated in oil bath. Both main gear and pinion are herringbone design, heat treated alloy steel. Air-operated, two-plate clutch is mounted on the main shaft within the main gear. Bearings are mounted behind the clutch plate. Cover, piston, and springs can be removed as a unit, permitting inspection of clutch lining with minimum of effort. Brake is adjustable from the floor. Wide, cast steel brake band with bolted-in lining is hinged and reversible for long wear.

Erie Foundry Co, Erie, Penna

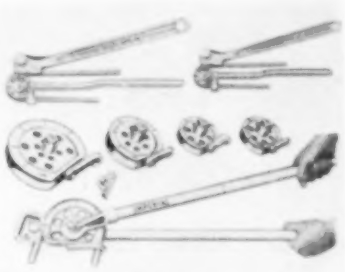


Tork-Lok Arbors Offered In New Short Series

Drawbar model of a shorter arbor and collet (available from stock) is designed to answer need for full support on short hole applications.

Over-all length of the arbor has been reduced in all sizes to about 2/3 of the length of the standard series. Interchangeable collets will cover the size range from ½ to 2 9/16 in. Collet expansion is 0.010 in the group from ½ to ⅞ in. and 0.020 in the group from ⅞ to 2 9/16 in.

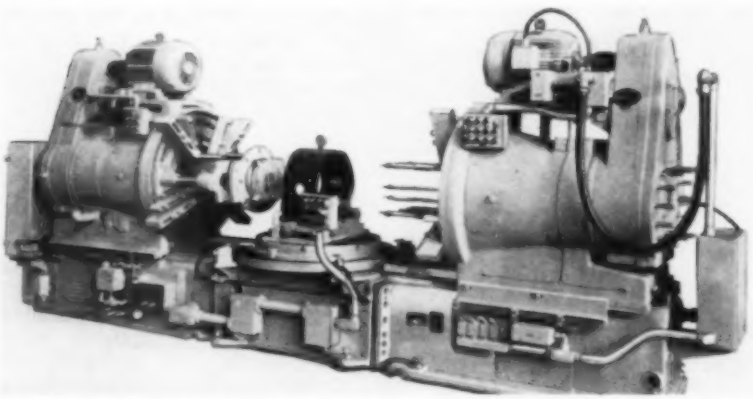
N A Woodworth Co, Standard Products Div, Detroit 20, Mich



Lever-Type Tube Benders Handle Both Hard and Soft Tubing

Combination lever-type tube benders are capable of bending hard drawn copper, steel (including JIC), aluminum, and stainless steel tubing and thin wall conduit, in addition to soft tubing. The tools can handle tubing ranging in size from ¼ to ⅞-in. OD. Tools are capable of handling anywhere from 2 to 7 different sizes of tubing, depending on the model. Benders for four or more sizes are furnished in metal cases. Bulletin 3078 available.

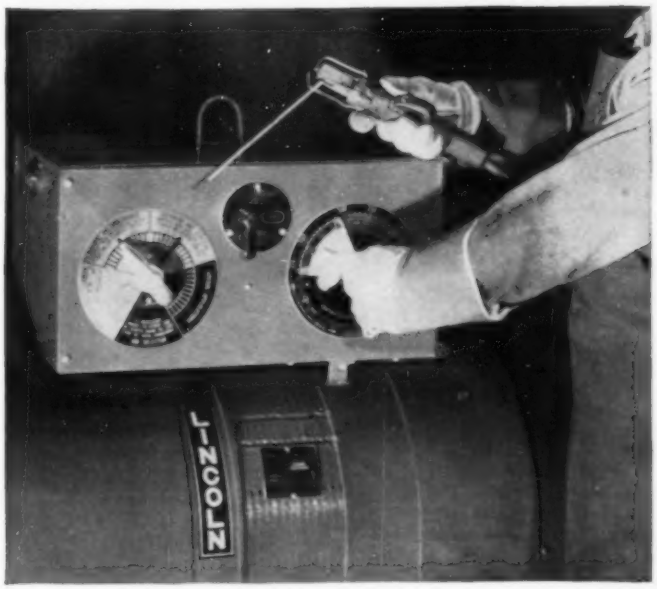
Imperial Brass Mfg Co, 6300 W Howard St, Chicago 31, Ill



ELECTRIC MOTOR FRAMES, sizes 360 through 500, are drilled and tapped on Natco machine that has two adjustable multiple-spindle heads and a 4-position index table. Unit also drills the brackets for these frame sizes. In processing the frames, index table makes four 90° turns; in drilling brackets, it makes one turn of 270° and one of 90°. Table is provided with four bushed holes for use in locating the fixtures; T-slots for bolting them down; and a revolving air connection so that air-clamping fixtures can be used—*National Automatic Tool Co, Richmond, Ind*

Weldynamics

ARC WELDING AT WORK CUTTING COSTS



In Your Shop you can take advantage of Weldynamics by providing your weldors with the most efficient equipment.

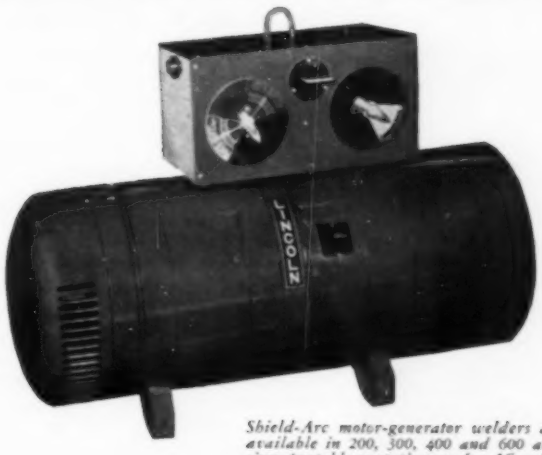
Lincoln Shield-Arc Motor-Generator Welders are Weldynamically designed for fast, easy welding under any conditions.

Dual Continuous Controls allow the weldor to select the kind of arc he likes to work with. He uses the current control to select the welding heat, and the voltage control to select arc "snappiness" and to fine-tune the welding heat.

Nearly Every Weldor is familiar with Lincoln Shield-Arc Welders, and most weldors prefer them.

Lincoln Applies Weldynamics in its own plant to cut manufacturing costs. These savings are passed on to you in better welding products for less cost.

Lincoln Representatives are trained in Weldynamics. They are equipped to help you with procedures, equipment and design. A letter or phone call is all it takes.



Shield-Arc motor-generator welders are available in 200, 300, 400 and 600 amp sizes; portable or stationary; for AC or DC power supply. Specifications and engineering data are contained in Bulletin SB-1362. Sent on request.

The World's Largest Manufacturer of Arc Welding Equipment

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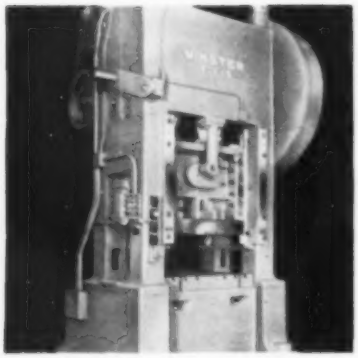
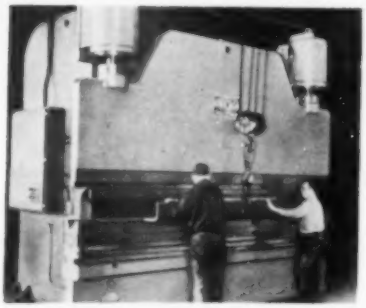


Minster Designs 400-ton Press For Heavy Material Blanking

Model 40E-9 heavy duty blanker is a straight side press designed for blanking high shear strength material up to ½ in. thick. Standard unit is a single-geared, single-end drive press that operates at speeds from 35 to 120 spm, depending upon length of stroke.

Rigid, 4-piece tierod construction incorporates features that assure continued alignment under constant heavy impact and fracture conditions. Full eccentric crankshaft applies force through extra heavy twin connections that maintain slide parallelism and distribute forces evenly. Additional construction features include electrically shrunk upper connection tiebolts; large diameter frame tierods also electrically shrunk for proper preload; and slide of extra rigid design guided by eight bronze lined ways. Minster patented combination air friction clutch and brake unit within main drive gear on eccentric crankshaft provides choice of operating speeds.

Minster Machine Co, Minster, Ohio



Hydraulic Press Brakes Added to Chicago Line

Units are currently available in six series with capacities from 300 to 2000 tons.

Hard ram insert and sectional ram clamp assure efficient use of all lengths of dies from very short to the full length of the ram. Two direct-acting cylinders are bolted and keyed to the housings for permanent, accurate alignment. Servo system with mechanical tape arrangement phases the action of the two pistons so that they always move in exact unison keeping bed and ram surfaces parallel no matter where the work is done. Micrometer dial arrangement in the tape system permits tilting the ram for tapered or fade-out work. Speed potentiometer offering infinitely variable ram speed up to maximum is incorporated in the ram movement. Length of stroke is easily and accurately controlled with full bending pressure obtainable at any part of the full stroke.

Complete hydraulic power unit is mounted on a platform between the housings back of the ram. Machine operation is controlled by a portable three-position foot switch.

Dreis & Krump Manufacturing Co, 7400 S Loomis Blvd, Chicago 36, Ill

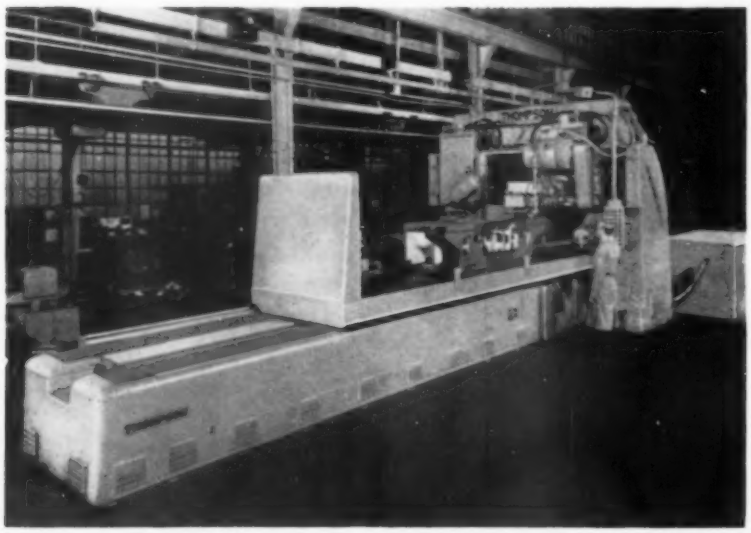
Bliss Introduces Line of Single-Point, Double-Action Presses

New line of single-point, double-action, enclosed toggle presses is designed to JIC specifications and incorporates all the latest in-building features. Ranging from 200 to 2000 tons in capacity, presses are of welded construction, using a four-piece frame with tierods.

Other features include a Bliss type K clutch and brake; full eccentric on plunger drive, with twin cranks on blankholder drive; twin main driving gears; motorized plunger adjustment; and a crown-mounted driveshaft.

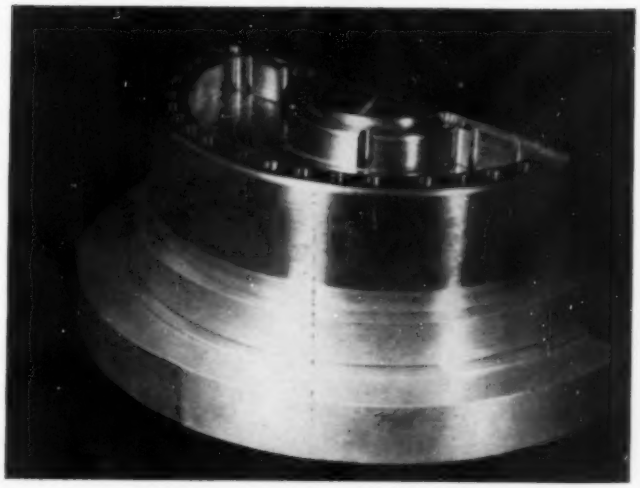
Piping, electrical controls, main panel, limit and automation switches are enclosed in the uprights. A recirculating oil system lubricates gears, shaft bearings, flywheel bearings, and all toggle link bearings. Grease is automatically applied to blankholder ways, plunger ways and blankholder wrist seats. Press is also equipped with control outlets for automatic feeding, unloading and transfer devices.

E W Bliss Co, Canton, Ohio



WAY GRINDER, Hydrall type with a work area of 48 x 36 x 240 in., is designed for grinding the ways of large machine tools. Horizontal and vertical wheel heads are independently operated. Horizontal head takes a 24 x 6 x 12-in. wheel and operates at 1200 rpm. Vertical head takes a 12 x 3 x 5-in. wheel and operates at 1800 or 3600 rpm. (Complete description appeared on p122 of Dec 30 '57 issue—*Thompson Grinder Co, Springfield, Ohio*

All these operations on complex pattern . . .



1. Face top of bronze casting to height.
2. Face end of casting at centerline.
3. Cut 2.260 radius and 4.225 radius .778 deep, leaving a .220 wall at centerline.
4. Cut 1.755 radius .200 deep with .200 radius at bottom.
5. By Vernier scale on mill, drill and bore 6 holes 15/64 diameter, 15/16 deep and 17 holes .450 diameter, 4½ deep with power fed head.

Completed in one setup with BOKOE #3 MILLER

1. Used as conventional mill
2. Conventional mill with rotary table
3. Boring mill for close tolerance—deep holes

How would you do it in your shop?

Could you handle so many different operations on *one* machine—in *one* setup?

They're doing it on the BOKOE Boring and Milling Machine at Morris Bean & Company, Yellow Springs, Ohio—producing intricate patterns like this for their Antioch Process castings for aircraft and missiles. And they tell us the BOKOE is so much faster, so economical and so accurate through the whole range of multiple operations that "the company's engineering people are most happy with their new do-anything tool."

More and more plants feel the same way about their BOKOE Millers—for the same good-production reasons. Companies like Convair, Ford, General Electric, Lockheed, General Motors, for example.

You will, too, when you see how the BOKOE #3 Universal Miller does the work of several machines—at the cost of only *one*. Worth writing for more details, isn't it? Or, talk it over with us.

KO CO., INC. PRECISION MACHINERY

KURT ORBAN

COMPANY, INC.

36 Exchange Place, Jersey City 2, New Jersey

Hydraulic Knife Grinder Offers Volume-Production Features

Unit is said to be capable of grinding 1500 knife blades, 8 in. long, in eight hours. Equipped with an 8 x 47-in. table, swivel head, automatic rapid traverse between stations, and a 3-hp 1160-rpm motorized spindle, unit can also be used for flat and hollow grinding of parts in volume production.

Spindle is mounted on sealed lubrication ball bearings. Hydraulic system has a Vickers V-104 E pump powered by a 1-hp motor. A 12-in. steel-back wheel is standard equipment. Machine can be furnished with a wet attachment.

Abrasive Machine Tool Co, Dexter Rd, East Providence, RI

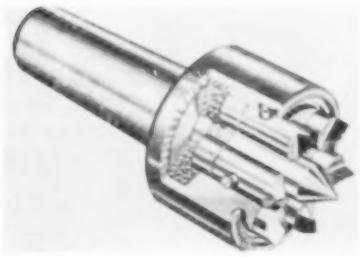
Self-Gaging Jig Borer Speeds Nuclear Reactor Production

This specially designed machine incorporates a built-in gaging device and is capable of drilling, boring, and milling to an accuracy of 0.0001 in. The gaging unit, which can accommodate several different types of gages, is an integral part of the machine and acts as a probing device to accurately position the cutting operation.

Basic machine is a standard P&W 4E Electrolimit jig borer. The rotary table however, is provided with milling feeds, and the machine columns are 15 in. higher than the maximum usually supplied.

The probe bar used to locate the "free paths" is mounted on the side of the column and is power fed up and down in a special bearing mount.

Pratt & Whitney Co, Inc, West Hartford 1, Conn



Driving Center Holds Work Without Chucks, Clamps or Dogs

Drive unit, named the Driving Center, uses basic hydraulic and friction principles to grip one end face of work held between centers, without use of chucks, clamps or dogs. When the device is in operation, the back ends of the driving pins are pressed back into a circular chamber which is filled with hardened steel balls. The balls act as a "fluid," distributing pressure equally to all driving pins and locking them and the centering pin securely when the driving points have been driven into the work.

Units are available to fit Morse tapers No. 2 to No. 6, and work diameters from 0.407 to 6.375 in. Backlash, slack and chatter problems are reported to be eliminated, and the unit functions equally well with uniform workpieces, rough castings, forgings, and other uneven shapes or surfaces.

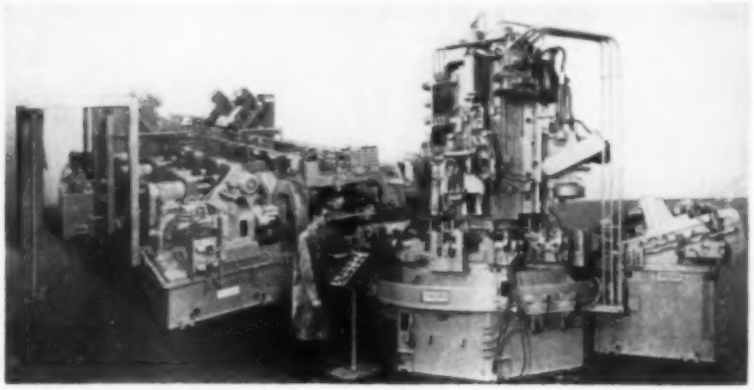
Ideal Industries Inc, Sycamore, Ill

Heavy-Duty Jet Cleaner Introduced in Electric Model

Hydro Steam-Jet Cleaner makes scalding hot water, and/or saturated steam continuously available at pressures up to 185 psi. Separate lightweight lances are provided for directing jets at high velocity on equipment or surfaces to be cleaned. Nozzle of the steam lance can be rotated to reach inaccessible areas and corners. Detergents or solvents are automatically added to hot water or steam jet under fingertip control of the operator.

Unit is available for 220, 440, or 550-v, 3-phase, 60-c power supply. Although designed primarily for stationary installation, model may be made portable at extra cost.

Pantex Manufacturing Corp, PO Box 660, Dept SG, Pawtucket, RI



AUTOMOTIVE AXLE HOUSINGS are machined at the rate of 75 per hr on this automated machine which combines a center-column-type machine with an in-line transfer machine. From the 76-in.-dia, 4-station center-column machine, semi-finish-machined parts are transferred to the 17-station transfer machine— ***Snyder Tool & Engineering Co, 3400 E Lafayette Ave, Detroit 7, Mich***

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MACHINE COMPANY

the man who needs
a new machine tool is
already paying for it

. . . And so goes the profit

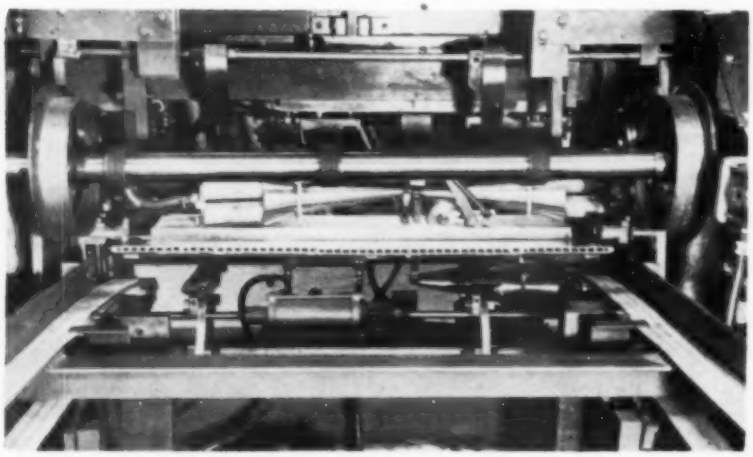
Consistent accuracy can be a costly thing. Particularly when it doesn't exist. And when it doesn't exist, productive labor in the U. S. A., the highest priced commodity of its kind in the world, is being mis-used.

When setting net sales prices which will give a fair profit and still remain competitive, it is an absolute necessity to stay within your manufacturing cost estimates. And you know in which direction they go when hampered by scrap, and production down-time.

So — don't be fooled by existing equipment that seems to be still useful. Take a closer look and see if it is still *profitable*.

Our brochure on Machine Tool Replacement analysis is yours for the asking. Write to Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools



Gulton Introduces Automated, Continuous Seam, Ultrasonic Welder

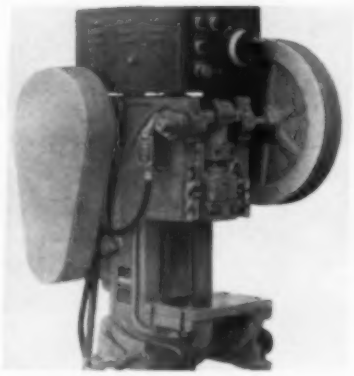
Reported to be the first automated machine of its type, this welding machine is capable of welding sheet metal from 0.080 in. thick down to very fine foils. It will join aluminum to aluminum, aluminum to stainless, or any two dissimilar or similar metals. The piece to which the sheet metal is to be welded can, under present setup, be five inches thick or more, if necessary, because the machine operates from only one side of the joint.

Designed originally for a job requiring 30-in. seams, the machine can handle seams of any length by slight re-design of the mechanical equipment. Each of four welding heads travels at 50 ipm. The power supply consists of two, 2-kw generators which operate alternately depending on the forward or backward motion of the heads, and which supply 500 watts to each head. A feedback system maintains the correct frequency (about 20,000 cps) and automatically shuts the machine down if trouble develops.

Through high frequency alone, any two pieces of metal can be joined as a result of a molecular transference or plastic flow at the interface. Welding temperatures are well below the melting point of either metal. The welds produced are reported to be stronger than either of the original metals. Units will range in price from $15,000 and up depending upon application.

The prototype welder was designed to weld corrugated sheets to long, curved aluminum extrusion. Its operation is completely automatic, including the feed.

Gulton Industries, Inc. Metuchen, NJ

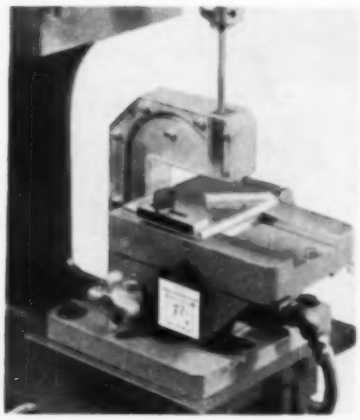


Kenco 8-ton Punchpress Has Extra Safety Features

Electro-Safe unit is designed so that operator must depress two widely separated hand controls when using the press for single-trip operation, and hold until the ram reaches bottom of the stroke. Flywheel-in-motion and clutching mechanism hazards are eliminated by use of a special high-starting torque motor that delivers power directly to the crankshaft. In single-trip work the motor goes dead after every cycle so that dangerous double tripping cannot occur. When power is disconnected, or fails, a heavy-duty brake is applied automatically. In addition, press can be stopped instantly at any point in the stroke cycle by means of an easily reached stop button. Any press failure, either mechanical or electrical, must fail safe.

Press can be locked in any desired setting—continuous, single, inch, or foot control—by authorized personnel. In order to protect the die, a safety stop switch in the control panel enables any type of mechanical or electrical detectors to stop the ram immediately if imperfect feeding or stamping is detected, thereby eliminating need for an operator on automatic feeding. Ram is precisely positioned with an inch button instead of by hand-rotating a heavy flywheel. Electronic switching arrangement permits cycling the ram to start and stop in any position, or as often as desired in any one cycle. Two models are available: standard OBI and 12¾-in. deep throat.

Kenco Manufacturing Co, 5211 Telegraph Rd, Los Angeles 22, Calif



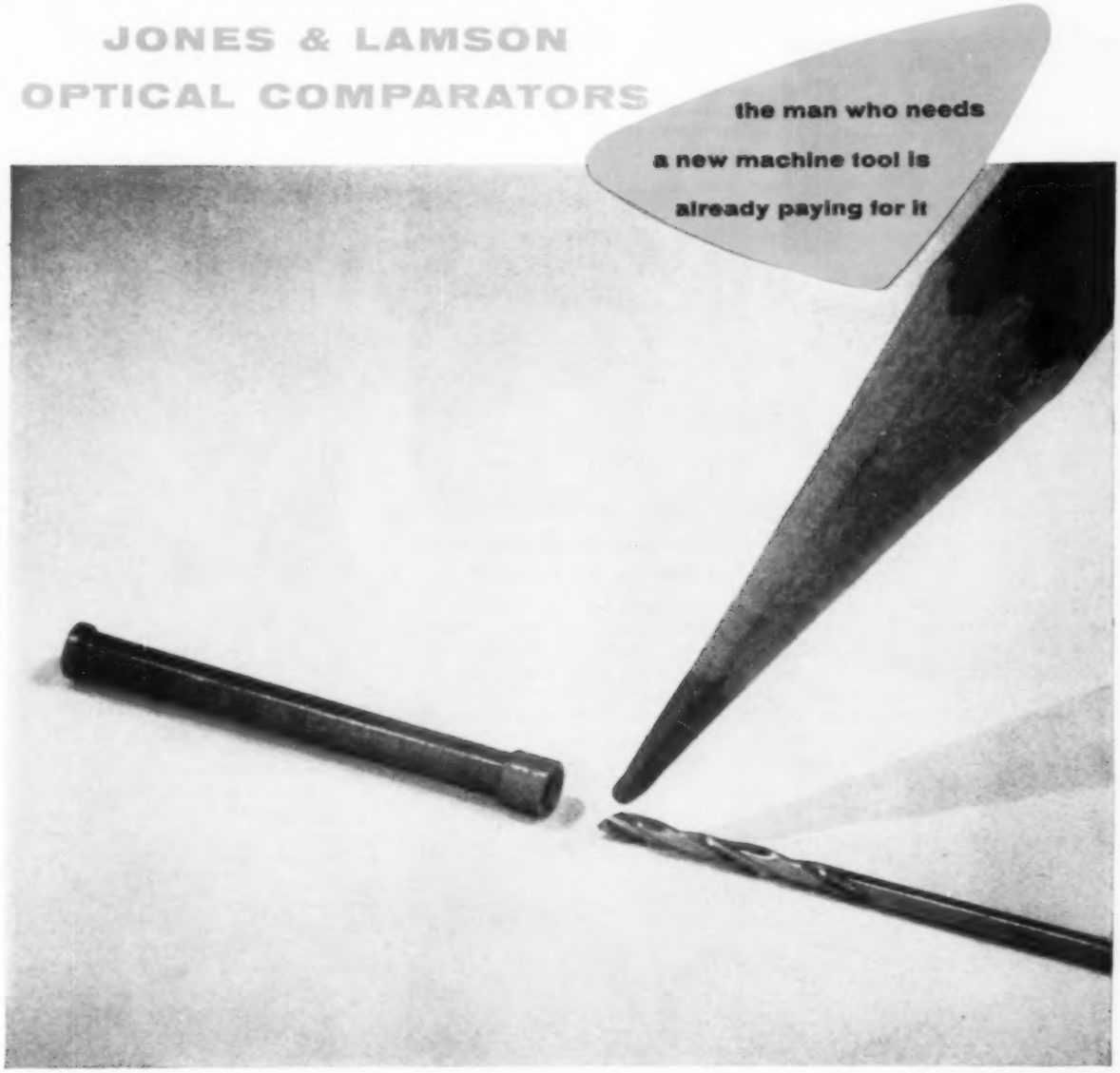
Ball Burnishing Fixture Handles Wide Range of Parts

Universal workholding fixture, known as the Ball-O-Matic, is used for sizing and finishing holes by the company's ballizing process. The fixture accommodates a wide range of parts for ballizing holes of 1/16 to ½ in. dia. It features a track with a single ball air-return action and can be used on an arbor press, drillpress, vertical broach, hydraulic press or any other machine having a ram which will hold a push rod.

The V-shaped anvil shown takes parts up to 3 in. OD and 1⅝ in. high. It can be replaced by an anvil blank that can be drilled or countersunk to suit specific parts, or by an anvil with a lever-operated jaw that prevents distortion of slotted holes during the ballizing operation. Unit may be bought as complete unit or parts may be purchased separately. The base is 7 in. sq; unit stands 8 3/16 in. high. Further details on the equipment and the ballizing process are available in 16-page bulletin BZQ-11.

Industrial Tectonics, Inc, 3686 Jackson Rd, Ann Arbor, Mich

JONES & LAMSON
OPTICAL COMPARATORS



How sharp is your figuring pencil?

This was a fascinating production problem! The customer for these little tubes is the world's fussiest and most exacting — Uncle Sam. And the production run was close to two million. There's a stepped hole running the length of these little pieces — that is, in the accepted ones. But the *drills* weren't fussy. Three-quarters of the time, they'd go right out through the sides of the work pieces. Needless to say, drill breakage was high.

Staging the drills on a J & L Comparator revealed that some drills had curvatures. The magnified shadow of this tiny drill filled the thirty inch glass screen. The pencil is shown here, first: to dramatize the scale, and secondly; to suggest that you sharpen your pencil to find out just what inspection errors are costing you. Want to see optical comparators at work? Ask for a showing of "Beyond the Shadow of a Doubt", our 16mm, color, sound film. Jones & Lamson Machine Co., 502 Clinton Street, Springfield, Vermont.

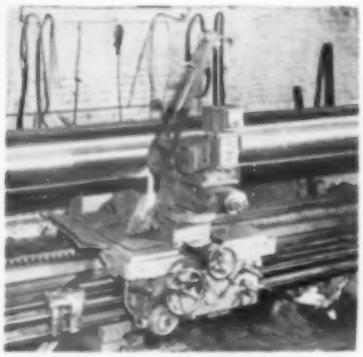
Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Attachment Permits Taper Turning, Boring and Threading

Device known as the Master Taper attachment can equip any bench lathe to perform taper turning, boring and threading—internal or external—as simply as straight line tool operation. Original installation requires the drilling of only two holes on the carriage for fastening the overarm.

Tapers up to 4 in. per ft, or 20° in either direction are possible for a maximum of 12 in. longitudinally. Swivel bar with V-ways is graduated in degrees at one end, inches at the other. Standard lightweight attachment ranges in price from $45 to $49.50, depending on lathe type and work capacity. A heavy-duty model is available for larger lathes, priced from $125 to $149.50 depending on lathe model. Only two dimensions are required for factory fitting—length of lathe carriage and distance across top of the 45° V-way.

General Sales & Engineering Co, Dept AMN, 4525 N Clark St, Chicago 26, Ill



Roll Grinding Attachment Grinds Both Metallic and Rubber Rolls

The Curtis RG-2 roll grinding attachment uses an abrasive belt to grind both metallic and rubber rolls while producing accuracy and finishes equal to those obtained by traditional methods of roll grinding.

Tests show 50-80% time savings on grinding and polishing steel, cast iron, brass, aluminum, and stainless steel rolls, while maintaining exacting tolerances for either special, straight or crowned rolls.

On rubber rolls, the RG-2 attachment and an abrasive belt removed up to 5/16 in. of stock per pass without tear marks.

Carborundum Co, Coated Abrasives and Curtis Machine Divisions, Box 477, Dept RG, Niagara Falls, NY

Low-Lift Hand Truck Line Includes Mechanical and Hydraulic Models

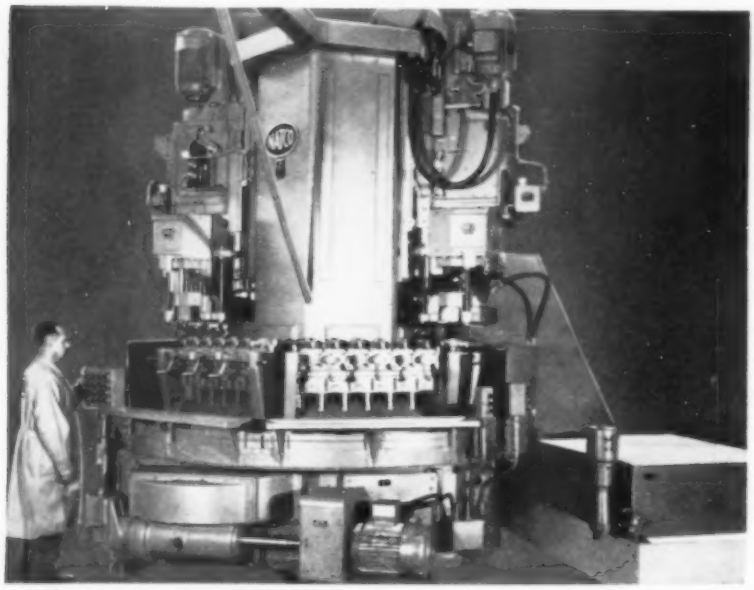
Most recent additions to company's line of industrial trucks, these nonmotorized hand lift trucks are available in the following models: Model AZN—mechanical lift, single stroke, 1000-lb capacity, platform or open-face pallet; Model AB—mechanical lift, single stroke, 2500-lb capacity, (Model AEZ has 4000-lb capacity) platform type; Model AJ (illustrated)—mechanical lift, multiple stroke, 2500 and 4000-lb capacity, platform; 2000 and 2500-lb capacity, double-faced pallet and tin plate (also designated Model AJ).

There are two heavy-duty models: Model AY—mechanical lift, multiple stroke, 4000, 6000 and 8000-lb capacity, platform; and Model AH—hydraulic lift, multiple stroke, 4000, 6000, 8000 and 10,000-lb capacity, platform. Model AH is also available as a 2000, 4000 and 6000-lb capacity unit for single and double-faced pallets and tin plate.

A foot lift model, Model AA, is a hydraulically operated, multiple-stroke unit, with a capacity of 2000 lb, and is designed to handle single and double-faced pallets.

Wheels available include steel, rubber-tired or floor-saver (impregnated canvas) type.

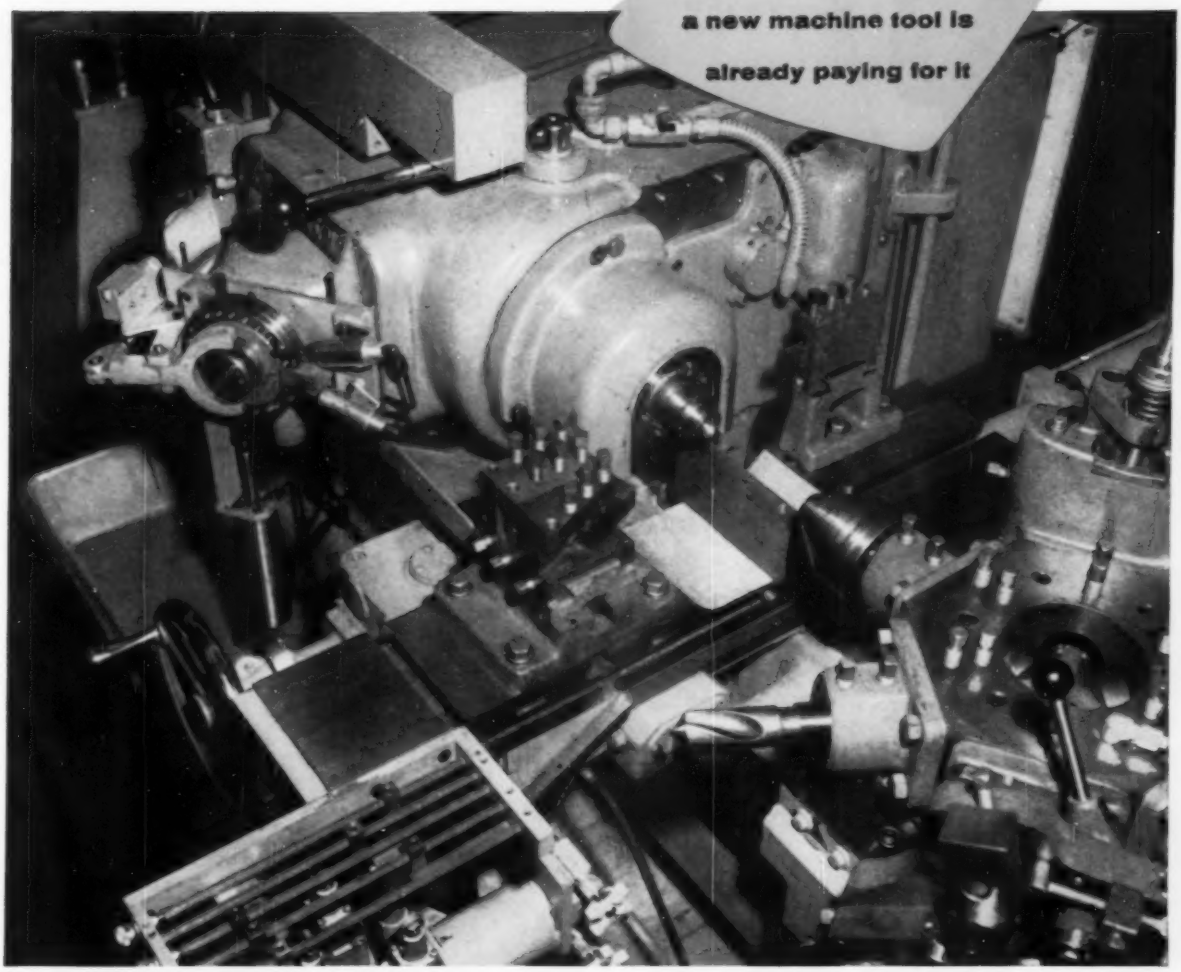
Automatic Transportation Co, Div of Yale & Towne Mfg Co, 149 W 87 St, Chicago 20, Ill



FORGED STEEL CONNECTING RODS are produced at the rate of 435 units per hr on these two, 100-in.-dia, 6-position, center column machines. The machines work in series and are arranged to hold six parts in each position. In the first machine, piston pin holes are drilled, core-drilled, chamfered and reamed. Parts are then sawed to produce rods and caps. In second machine, two holes for attaching caps to rods are drilled, chamfered and reamed—*National Automatic Tool Co, Inc, Richmond, Ind*

JONES & LAMSON
"AUTOMATION"

the man who needs
a new machine tool is
already paying for it



Where's the Operator?

And for that matter, where's the speed selector? The answer is that they're both absent, because this is a *completely automatic* production operation. It's a custom installation of a Lynn Hydraulic Drive on a Jones & Lamson ram type turret lathe.

This assembly provides fully automatic cycling for both long and short runs. The turret drive provides for rapid approach to the work, variable feeds, controlled dwell, reverse feed, and rapid return of the turret. The cross slide has automatic cross travel in both directions. Feed ranges for the cross slide drive are equivalent to those of the turret drive.

Spindle speed selection, start, stop and reverse are all automatic. Operation of collet chucks and bar feed is also automatic for a continuous repetitive cycle.

Two typical set-ups increased production 26% per machine. One operator handled both machines with ease. Investigate how you can get similar results. Write for literature — Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

BENCH-TYPE DRILLPRESS, Model T6-B, features 0 to 7/32-in. capacity, hydraulic head raising, sensitive hand feed controls with adjustable spring return, and a precision spindle. Machine weighs 176 lb and is operated by a two-speed, ¾-hp motor permitting eight speeds from 3600 to 12,000 rpm—*Distributed by Olivetti Corp of America, Machine Tool Div, 42-33 Northern Blvd, Long Island City, NY*

Barrel Finishing Machines Introduced in 15-Model Line

No. 30 Series consists of fifteen models with capacities from 5 to 25 cu ft. Use of oversize vari-speed V-belt system instead of conventional chain drives is said to reduce shock and vibration to a minimum. Precision vulcanize-molding of sealing surfaces on both the cylinder opening and cylinder door is said to insure leak-proof design.

Pushbutton controls (located on the left side of the machine) with positive safety jogging allow operator to inch cylinder forward or reverse during loading or unloading. Front closure extends well below cylinder and machine stops if closure is raised. Variable speed is standard with speed control handle mounted in front. Motor is standard NEMA re-rated 1800 rpm on fixed mount at rear. One to five horsepower is used, according to machine size.

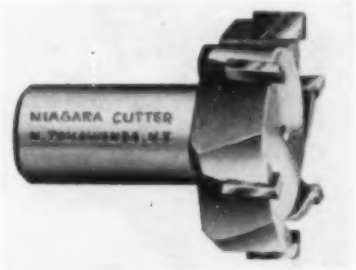
Crandall Engineering & Manufacturing, Inc, Vicksburg, Mich

Dust Collectors Available With Capacities of 400 or 600 cfm

Latest in company's line of dust collectors, the Junior Cyclone Dus-Kolectors are available in two capacities, 400 and 600 cfm, and operate on the same principle as the larger models—centrifugal precipitation and gravitation for the removal of larger particles. The latter are deposited in the removable receptacle in the base. Smaller particles are exhausted outdoors or trapped in a bag attached to outlet. Bag is easily removed and emptied. If bag is used, the air is recirculated, thus saving heat.

Units are 53 in. high. The 400-cfm model operates on a ½-hp motor; the 600-cfm model on a 1-hp motor. The wheel, which is mounted on the exhaust side to prevent clogging, is a self-cleaning paddle type, dynamically balanced to minimize vibration.

Hammond Machinery Builders, Inc, 1618 Douglas Ave, Kalamazoo, Mich

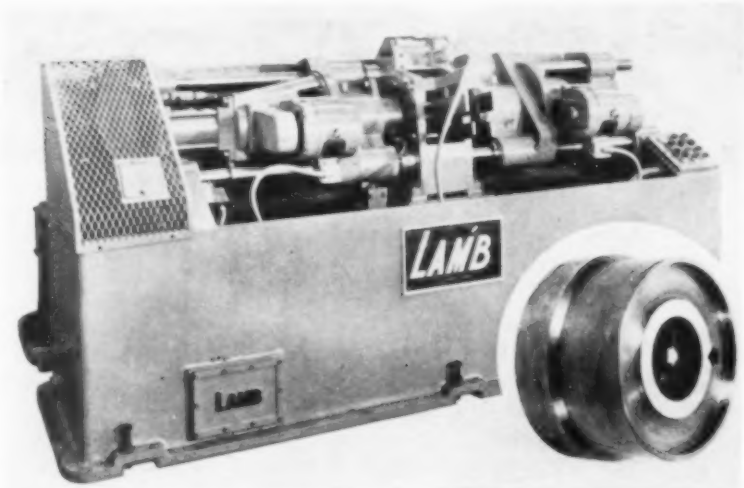


Niagara Carbide Face Mills Offered in New, Larger Sizes

Units with 3 and 3½-in. diameters with 1¼-in. integral shank, and 4-in. diameters with 2-in. shank have been added to Niagara line.

Stubby design brings cutter close to spindle bearings, reducing overhang and strengthening tool support and rigidity so that max capacity of the milling machine can be used when working aluminum, brass, magnesium, and steel. Necessity for special adapters or holders is eliminated.

Bollier-Damerell, Inc, Niagara Cutter Div, 330 Niagara St, N Tonawanda, NY



AUTOMATIC BURNISHING MACHINE burnishes two opposing faces of a cast iron transmission drum (insert) at the rate of 360 pieces per hr. Machine cycle time is 8 sec; finish is 15-25 RMS. Two opposing machine heads are controlled to give equalized burnishing tool pressure. Machine provides for handling of larger parts. Both manual and automatic operation are possible, with burnishing time adjustable from 1 to 55 sec—*F Jos Lamb Co, 5663 E Nine Mile Rd, Detroit 34, Mich*

JONES & LAMSON
MACHINE TOOLS

the man who needs
a new machine tool is
already paying for it

Out-of-this-World Accuracy

Whether they're destined to go "out of this world" or not, many jobs demand some "out of this world" machining. Here's one, on a J & L lathe which is adapted for two-way tracing from the hexagon turret. Critical dimensions on both internal and external tapers, plus several intricate contours are finish-machined in one chucking.

A three-way indexing template holder is push-button controlled. Thus, down-time for template changes is eliminated, and the 180° tracer continues to machine on both the forward and return feed of the saddle carriage.

A single selector switch disengages the tracing unit and the machine is ready for normal* turret lathe operations.

*("Normal" for J & L turret lathes means unsurpassed accuracy, high production, and low, low maintenance.) For details, write for our descriptive folder No. 5425. Jones & Lamson Machine Company, 502 Clinton St., Springfield, Vermont.

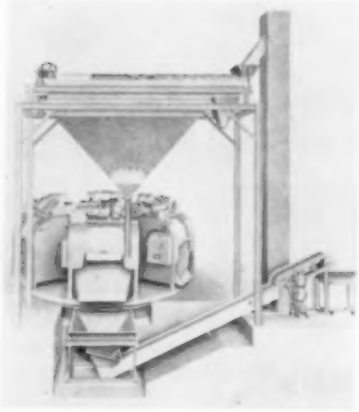
Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Tool Simplifies Manual Indexing For Straight or Spiral Operations

Indexing tool, called Trig-R-Dex, is reported to offer fool-proof and trouble-free indexing for straight or spiral operations. To index, simply grasp the handle, push down on trigger button, move the handle until index pin engages the next hole, and pull handle to stop position.

Both right- and left-hand operations having from one to ten spaces can be accurately indexed. Indexing plates having the number of spaces and exact spacing required are available. Changing plates takes but a few minutes.

Detroit Reamer & Tool Co, 780 W Maple Rd, PO Box 174-R, Birmingham, Mich



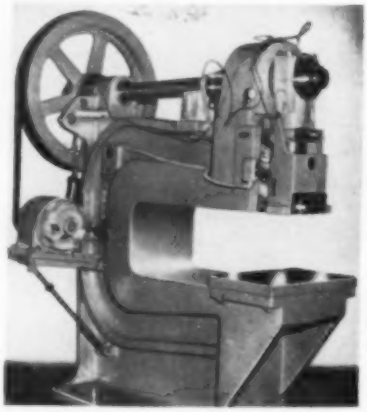
Barrel Finishing System Permits One Man to Handle Six Machines

This six-station automatic barrel finishing system, mounted on a turntable and equipped with a "memory" device, automatically rotates completed work to a single operator station for unloading and reloading. New system makes it possible for a single operator to handle six finishing machines (if two units are combined, he can handle 12 machines).

As operator loads each barrel, he sets its timer for a predetermined processing cycle. This time cycle also records on the memory device which automatically signals the timed-out barrel and rotates it to the operator's station when the work is completed. Continuous processing times of 15 min to 50 hr are available.

Media and parts, at finish of cycle, are metered onto a conveyor belt for transfer to a magnetic separator (vibrating screen can be used for nonferrous parts). The media feeds directly to a bucket elevator and is carried to the overhead rotary screen media classifier and storage bin. As many as six different media can be used.

Almco, Queen Products, Inc, Albert Lea, Minn



45-TON PRESS, Model 15M, has 36-in. throat depth, 4-in.-dia shaft at pin bearing, 24 x 16 bed area, 14-in. open height, 750-lb 38-in. end flywheel, alloy cast frame; total weight, 11,000 lb. Available in plain and geared models, and with pin or air clutch—*Perkins Machine Co, Warren, Mass*

Finishing and Roughing Bars Designed to Minimize Setups

Adjustment and blade exchanges can be made without removing bar from machine. Floating mount permits chip load to balance between the two cutting edges, reportedly producing a far smoother surface on precision finishing operations.

Blades are adjustable, covering a wide range of bore sizes and allowing for numerous regrinds. Several blade sizes are available for each bar. Inside faces of blades are serrated, mate to allow longitudinal adjustment without skewing. Expansion or contraction of bore size is controlled by internal socket head setscrew. Size is attained by miking across blade edges while adjusting or by grinding to diameter. Blades are furnished in M-3 HSS or carbide tipped.

Robert H Clark Co, 9330 Santa Monica Blvd, Beverly Hills, Calif

Ultrasonic Cleaner Performs Difficult Cleaning Operations

This 2-kw ultrasonic cleaner is designed for small part cleaning, blind hole washing, removal of radioactive contamination, printed circuit cleaning and other difficult operations. The generator delivers 2-kw of power to magnetostrictive transducers welded into the bottom of the stainless steel tank. The 9 x 14 x 13-in. deep tank holds 5 gal.

Water cooling of the nickel transducers allows use of cleaning solutions at temperatures to 450 F. A 0-15 min timer is provided to shut off the generator at a predetermined time. A by-pass switch permits continuous operation. The generator and tank are available either rack mounted (illustrated) or in matching bench-type cabinets.

Alcar Instruments, Inc, 17 Industrial Ave, Little Ferry, NJ

CORRECTION—

The Wales-Strippit corner notching unit which appeared on page 170 of the Dec 16, '57 issue and on page 201 of the Jan 27,. '58 Production Preview issue carried the company address as Akron, Ohio. This should have been Akron, NY

FYI

FOR YOUR INFORMATION

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MACHINES AND ATTACHMENTS

1 GEARED-HEAD LATHES—*Farrel-Birmingham Co, Consolidated Machine Tool Div, 565 Blossom Rd, Rochester 10, NY.* 32-page bulletin 1216 presents illustrated description of heavy-duty units in standard sizes from 48 to 144 in. Covers construction, design, operating features, specifications.

2 ELECTROPOINT TAPE CONTROLLED TURRET DRILL—*Burg Tool Manufacturing Co, 15001 S Figueroa St, Gardena, Calif.* 12-page bulletin gives details on two new Burgmaster models, one with ⅝-in. capacity (6 spindle), the other with 1¼-in. capacity (8 spindle). Electropoint system fully described. Case histories illustrate use advantages.

3 GRINDING MACHINE ATTACHMENTS—*Cincinnati Milling Machine Co, Cincinnati 9, Ohio.* 14-page catalog G-701 illustrates and describes variety of attachments for centertype, centerless, and roll grinding machines.

4 PRESSES — *Minster Machine Co, Minster, Ohio.* Illustrated 8-page bulletin contains data on MS2 two-point, straight-side, double-geared units in capacities from 150 to 500 tons. Intermediate shaft combination air friction clutch and brake drive arrangement described and pictured; specifications included.

5 TAPE CONTROL SYSTEM — *Bendix Aviation Corp, Controls Section, 21820 Wyoming Ave, Oak Park, Mich.* 12-page illustrated catalog BR-1 describes system for automating machine tools. Operational details discussed. Modification of typical machine for use of system is outlined; specifications for tape preparation and machine control units included, as well as case histories.

6 PLASTIC INJECTION MOLDING MACHINE — *Hydraulic Press Mfg Co, Div of Koehring Co, Mount Gilead, Ohio.* 8-page bulletin 5732 covers new H-P-M 32/42-oz-capacity Model 650-HV. Features illustrated; specifications and optional equipment included.

7 ECCENTRIC GEAR PRESSES — *Baldwin-Lima-Hamilton Corp, Hamilton Div, Mechanical Press Dept, Hamilton, Ohio.* 8-page bulletin 13301 contains application and design information on expanded line of straight-side units for deep-drawing and other heavy-duty requirements. Units range from 300 through 2000 tons. Specifications, construction features included.

● THREAD ROLLING HEADS—*National Acme Co, 170 E 131st St, Cleveland 8, Ohio.* 20-page illustrated Acme-Fette catalog NAF-57A discusses advantages of rolling threads from end of workpiece with self-opening thread rolling heads that can be used on either rotating or non-rotating spindle machines. Eight styles provide for capacities from 1/16 to 2 in. Request direct on company letterhead.

TOOLS AND ACCESSORIES

8 SOLID CARBIDE CUTTING TOOLS —*Rotary Tool Industries, Inc, 4461 W Jefferson Ave, Detroit 9, Mich.* 28-page catalog 257 contains specifications on 60 different series including end mills, drills, reamers, and burs. Charts indicate speeds and feeds recommended for material at various Rockwell hardnesses.

9 MAGNETIC AND VACUUM CHUCKS—*O S Walker Co, Worcester 6, Mass.* 20-page catalog 58 illustrates and describes line of permanent magnetic and electro magnetic chucks (standard rectangular, vertical, swiveling, rotary); control equipment; and vacuum chucks designed to special order.

10 CHUCKS, COLLETS, CHUCKING EQUIPMENT—*Gisholt Machine Co, 1245 E Washington Ave, Madison 10, Wis.* 23-page catalog (Form 1117-C) pictures and describes heavyduty Masterline units. Data included on power chuck wrenches, air cylinders, and special work-holding equipment illustrated by job applications.

Fill in number of each bulletin wanted

Name _____

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Business Address _____

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FYI
FOR YOUR INFORMATION

11 MIST COOLANT EQUIPMENT — *Bijur Lubricating Corp, Rochelle Park, NJ.* 4-page bulletin F-7 gives detailed information on Spraymist equipment containing all elements in compact integral unit that can be mounted anywhere on the machine. Range of applications illustrated and discussed; engineering data on components provides selection and ordering information.

12 CENTRALIZED LUBRICATION SYSTEM — *Stewart-Warner Corp, Alemite Div, 1826 Diversey Parkway, Chicago 14, Ill.* 36-page illustrated Form 34-28 describes "Accumite," a low-pressure, positive displacement, miniature lubrication system designed for machine tools and other machines which have numerous bearings and limited installation space. Components and accessories covered; system application data and installation procedure included.

13 AIR - OPERATED CHUCKING EQUIPMENT—*Cushman Chuck Co, Hartford 2, Conn.* 12-page illustrated condensed catalog PO-65C-1958 lists, with dimensions and prices, complete line of air-operated chucks, cylinders, and accessory equipment.

14 CONTROL INSTRUMENTS — *Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Penna.* 56-page catalog C60-2 describes complete line of Brown filled-system indicating, recording, controlling thermometers for use between temperature limits of −125 to +100 F.

HEAT TREATING AND WELDING

15 MANUAL ELECTRODES — *Lincoln Electric Co, Cleveland 17, Ohio.* 12-page Weldirectory simplifies selection of electrodes for mild steel and low alloy, high-tensile steels. Basic characteristics described, physical properties, current ranges, sizes, welding procedures, applications.

16 VACUUM MELTING FURNACE—*F J Stokes Corp, Vacuum Equipment Div, 5500 Tabor Rd, Philadelphia 20, Penna.* Data Sheet 660 describes and illustrates features of Model 436 induction heated unit with melt capacity of 50 lb.

17 AUTOMATIC WELDING EQUIPMENT—*Airline Welding & Engineering, 785 N Prairie Ave, Hawthorne, Calif.* 4-page bulletin 5-12-57 discusses features, advantages, gives specifications of circumferential welding machines, longitudinal welding positioners, and weld roll planishing machines.

PLANT SERVICE EQUIPMENT

18 MECHANICAL FINISHING PROCESS—*Roto-Finish Co, 3700 Milham Rd, Kalamazoo, Mich.* 24-page catalog gives information on precision metal finishing by mechanical barrel-finishing methods. Roto-Finish equipment illustrated and described; basic machine dimensions; capacities; recommended work loads; standard accessories covered.

19 MATERIALS HANDLING EQUIPMENT — *Heppenstall Co, Materials Handling Div, 5th Ave & 16th St, New Brighton, Penna.* 21-page catalog contains illustrated descriptions of automatic and motorized tongs for lifting material of any shape, weight, or size; sheet and rack lifters, motorized rotating hooks, C-hooks.

20 VACUUM METALLIZING — *F J Stokes Corp, Vacuum Equipment Div, 5500 Tabor Rd, Philadelphia 20, Penna.* 22-page catalog 780 describes process, illustrates applications. Gives specifications for all current models including units with 24, 36, 48, and 60-in.-dia vacuum chambers.

21 HEAVY-DUTY ELECTRIC HOISTS —*American Chain & Cable Co, Wright Hoist Div, 929 Connecticut Ave, Bridgeport 2, Conn.* 24-page bulletin E-58 covers line of Frame 2 and Frame 3 units. Six types of Speedway models with lifting capacities of ½ to 10 tons are described. Ordering specifications, applications, included.

PARTS AND MATERIALS

● ELECTRICAL CONTROL EQUIPMENT—*Zenith Electric Co, 152 W Walton St, Chicago 10, Ill.* 64-page catalog 18 contains detailed information, technical data, and prices on all types of automatic equipment. Separate sections cover automatic transfer switches, contactors, special controls, and timing devices. Applications, engineering data, design specifications included. Request direct on company letterhead.

22 "TIMING" BELT DRIVES—*Morse Chain Co, Ithaca, NY.* 68-page catalog TB-58 covers following pitches: 1/5, ⅜, ½, ⅞, and 1¼ in. Includes engineering information, data on selection, installation, applications of these positive, lubrication-free drives.

23 SPEED REDUCERS, CUSTOM AND STOCK GEARS—*Grant Gear Works, Inc, 154 West Second St, Boston 27, Mass.* 180-page illustrated catalog gives details on sizes, ranges, specifications, capacities and types available. Speed reducer section covers eight basic types available in worm and gear, single and double reductions, and helical and miter gear with reduction ratios up to 3660:1.

24 SILICONES—*Dow Corning Corp, Midland, Mich.* 12-page illustrated report No. 10-105 outlines properties of silicones as dielectric materials. Discusses use of silicone rubbers, fluids, resins, and compounds in applications ranging from electric motor insulation to intricate electronic control systems.

25 HIGH TEMPERATURE SPRINGS —*Associated Spring Corp, Bristol, Conn.* 8-page illustrated bulletin explains how to design and select materials for springs that must operate successfully at high temps. Presents some available solutions to problems by proper selection of materials, choice of design stresses, and use of certain manufacturing processes such as heat setting.

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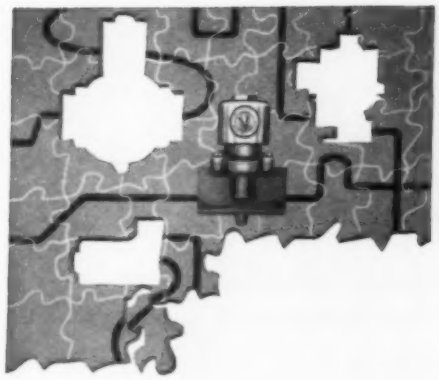


SKINNER'S NEW 2-WAY VALVE OFFERS

big capacity — high pressure

Here's the second new line of valves designed to answer your control "puzzles." This new line, called the R Series, is a two-way, pilot-operated piston valve with ¼" orifice and ¼" NPT. It is available normally open or normally closed and operates on a pressure differential of 5 to 200 PSI. This new R Series also includes an Explosionproof line in normally open and normally closed construction. A normally closed version will be available soon to operate on pressures up to 1000 PSI.

This new R Series uses the famous Skinner V5 Operator and will control air, water, oil and semi-corrosive media. The normally open version can, on request, be supplied with pilot exhaust piped to body outlet port.

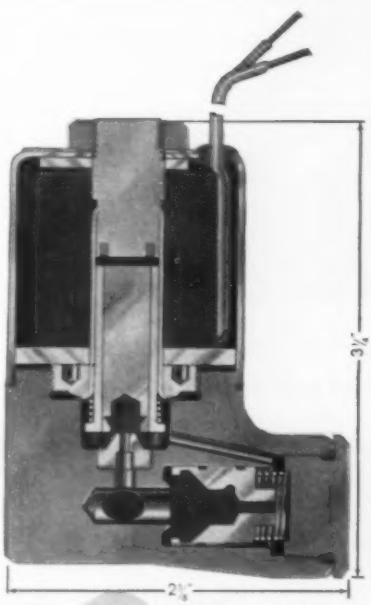
A wide selection of coils—high-temperature, waterproof and standard—for common AC and DC voltages is available, and there is choice of electrical connections such as Automotive Terminals, Grommet and Conduit.

The temperature range of this new line is −65° to 180°F Ambient, and −65° to 150°F Media. It is light in weight—only 1¼ pounds—and can be mounted directly to the line by means of the ¼" NPT. Distance between ports is 2 inches.

For complete information about this new line of Skinner valves, please contact our Representative or Distributor near you—you'll find him listed in the Yellow Pages. Or write us at the address below, Dept. 303.

CONSIDER THESE OUTSTANDING FEATURES...

- Internal Parts—Stainless steel—give long, trouble-free service
- Coil—Continuous duty—10 watts max.—UL-approved
- Body—Forged brass—dense metal structure
- Mounting—Direct-line—can be serviced without removal from the line
- Options—Explosionproof, Manual Override, Electrical



SKINNER ELECTRIC VALVES
THE CREST OF QUALITY

SKINNER ELECTRIC VALVE DIVISION
NEW BRITAIN CONNECTICUT
105 EDGEWOOD AVENUE

Automatic Unit Processes Wire From 1/16 to 5/16-in. Diameter

Shuster 2AV variable speed automatic wire straightening and cutting machine, added to Mettler line, incorporates Reeves variable speed units that provide choice of feed ranges from 50 to 200 fpm.

Features include high speed straightening arbor with five elongated split dies mounted on ball bearings for minimum vibration; Warner electric brake on clutch shaft; angled, electric control panel for one-position operation. Microswitch trips new, improved target with positive setting and positive release. Descriptive bulletin available.

Mettler Machine Tool, Inc, Adeline & Boulevard, New Haven, Conn

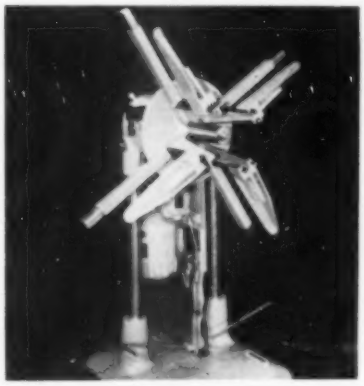
Model for Maintenance Lapping Added to Lapmaster Line

It is claimed that new Model 10 will consistently reface mechanical seals, valve seats, compressor disks, and a variety of other parts to a precision flatness of 0.0000116 in. and with micro-finishes of 2 to 3 rms.

Machine has two conditioning rings mounted on the 10-in.-dia lap plate which also serve as workholders to accommodate parts up to 3¾ in. in dia. Rings may be removed and the roller guide bars repositioned in order to allow room to take work up to 7 in. Parts may be of any shape, form, or material, including all ferrous metals, magnesium, aluminum, brass, carbon, ceramics and plastics. Lapping cycles are automatically controlled by a timing clock.

Unit operates from any standard 110v 60c single-phase outlet. Complete machine measures 18 x 13 x 12 in. including steel weldment base, enclosed motor and lapping table.

Crane Packing Co, Dept AMN, 6400 Oakton St, Morton Grove, Ill

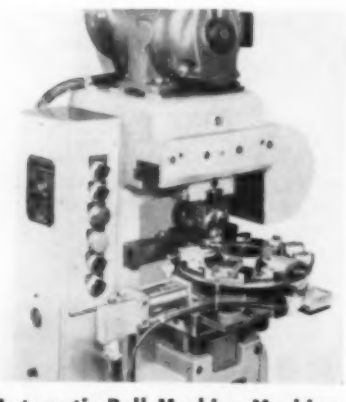


US Tool Adds Stock Reel To Automatic Pressroom Equipment

Model ACR-10-40 motor-driven unit is designed for material up to 10 in. in width, coils with ID from 10 to 22½ in., OD up to 40 in., weight capacity 600 lb.

Model is arranged with loop control mechanism, reversing switch, and 1/3-hp motor for operation on 220/440v, 3-phase, 60c ac. Expansion and retraction of cross arms of the reel, to vary the inside diameter, is done by power.

US Tool Co, Inc, Ampere (East Orange), NJ



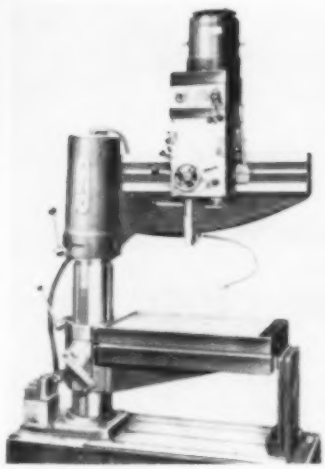
Automatic Roll Marking Machine Offered in High-Speed Model

Recipromark Model 490 is shown tooled for specific application—trade-marking on padlocks after assembly. In operation, die slide reciprocates continuously at approximately 400 spm.

Machine is equipped with two air-control units, one for the worktable, the other for an index table; each includes filter, pressure regulator, gage, and lubricator. Both air cylinders are equipped with speed control valves, and a dual control circuit is provided to operate all components independently for setup purposes.

Depth of mark is achieved by varying marking pressure and number of marking strokes.

Noble & Westbrook Manufacturing Co, East Hartford, Conn



British Radial Drill Features Speeds of 100 to 1500 rpm

Model AJ35 radial drill, a product of Ajax Machine Tool Ltd, Halifax, England, is designed to offer quick movement of the drill head. All controls are located so that operator can reverse and change feeds and speeds, lock and unlock both saddle and column from the same position.

Available in two sizes, 36 and 48 in., the machine has spindle speeds from 100 to 1500 rpm. The drilling table offers both rotary and up-and-down movement.

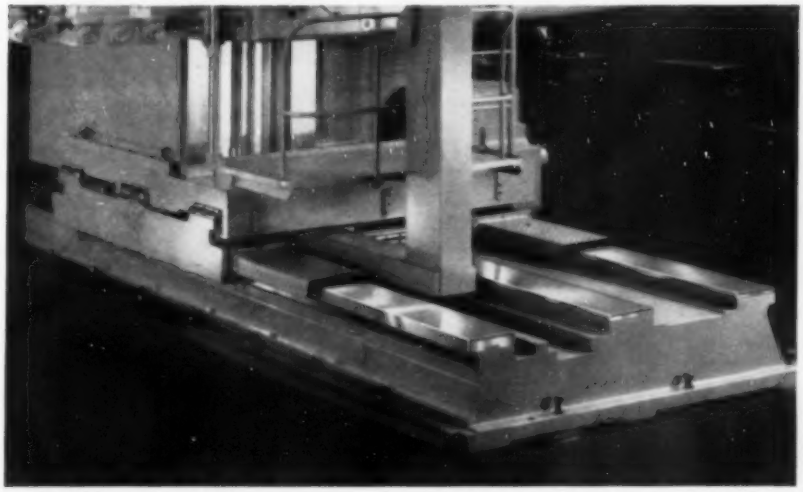
Also available (not illustrated) is the Ajax Model AJ4, a radial drill which provides three speed ranges, with eight speeds in each range. Speed ranges cover 62 to 744, 95 to 1140 and 126 to 1500 rpm. Machine is available with plain and universal box tables, or tilting table with 90° movement. It is made in 4, 4½ and 5-ft models.

Distributed by Morey Machinery Co, Inc, 383 Lafayette St, New York 3, NY

O-KNI-CO MACHINE TOOL news

PRODUCTION FACTS THAT INCREASE YOUR PROFITS

PUBLISHED BY THE OHIO KNIFE CO., CINCINNATI, OHIO



O-KNI-CO hardened bedways, cross ways on new GRAY 650 FC horizontal boring machine.

Big machine tool builders solve wear and accuracy problems with quality O-KNI-CO processed hardened ways and wear plates

The G. A. Gray Co., The Niles Tool Works of the Baldwin-Lima-Hamilton Corp., The Gisholt Machine Co. are among the many users of O-KNI-CO products.

By a time proven process, special analysis tool steel of any thickness is eternally bonded to a soft, tough, easily machinable steel, producing a superior way that will not warp or bow. Special O-KNI-CO hardening process (65-66 Rockwell C) to the full depth of the tool steel, along entire length of the way, develops amazing wear-resistant qualities.

Ordinary ways of one type steel, are usually heat treated by flame hardening, carburizing, or some similar process. This results in variations of depth and quality of hardness along the length of the way. The degree of hardness is usually well below the minimum standard (63 Rockwell C), necessary to eliminate galling, scoring and excessive wear. These conditions destroy the accuracy of the machine almost from the first day of operation, requiring continuous compensations in positioning of work.

O-KNI-CO processed hardened ways on 60 inch lathe made by The Niles Tool Works.

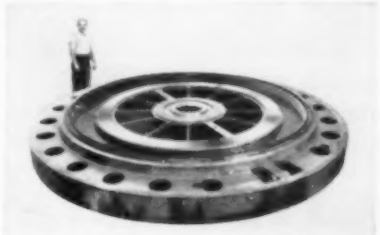
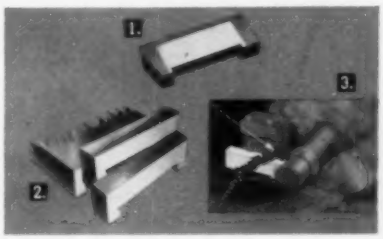


Table of Niles 20 foot vertical boring mill, inverted to show O-KNI-CO wear plates.

O-KNI-CO processed hardened ways are carried in stock in a variety of sizes and shapes, or made to suit your specific requirements. They are a perfect mating surface for either metal or non-metallic bearing surfaces. O-KNI-CO processed clad aluminum bronze wear plates are made by the same process and are available in standard stock sizes for quick delivery.

Gisholt Machine Co. gives amazing demonstration to prospective lathe buyers

Prospective lathe buyers witnessed an amazing demonstration of OK Bedway hardness at The Gisholt Machine Co., Madison, Wisconsin. Gisholt uses OK Ways exclusively on their ram and saddle turret lathes, and to prove their quality they (1) took a section from an OK Bedway, (2) made it into a tool bit, (3) locked it in a fixture and cut spiral shavings from 1045 cold-rolled steel.



Ohio Knife Co., big supplier of shear blades to equipment builders

Special O-KNI-CO heat treating techniques applied to shear blades give maximum toughness and superb edge holding qualities. Various grades are available for shearing. OK Battle Axe blades shear up to ¼" mild steel, OK Dura-chrome blades for shearing hot or cold plate up to 1¼" and OK Utility blades for short runs and heavy plate.

FREE technical literature available. Check off—mail coupon today.

THE OHIO KNIFE CO.
Dept. 66-W, Cincinnati 23, Ohio

Gentlemen: Please send me free copy of:

- ☐ HARDENED WAYS—Seven Cross Sections in over 60 sizes.
- ☐ SHEAR BLADES.
- ☐ SLITTING—A Basic Guide for the New Operator.

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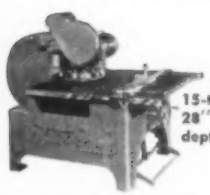
LOCATE and PIERCE in ONE HIGH SPEED OPERATION

. . . even intricate hole patterns are duplicated at almost unbelievably high speed with Wiedemann Turret Punch Presses—from prototype to medium production runs.

Using the high speed follower gauge, illustrated, openings are pierced in printed wiring boards, chassis, panels, truck and other fabricated parts at rates of 30 to 120 holes per minute. Other rapid gauging methods are also available—assuring you a Wiedemann that suits the size and nature of your work.

High speed operation is just one of the many ways a Wiedemann can cut your short run piercing costs 60% to 90%. Get all the facts. Send drawings of your work for time study and write for Bulletin 301.



RA-41P Wiedemann
15-ton capacity
28" throat depth

Other models from 4 to 150 tons

12 to 32 Punches and Dies Ready for Use

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TURRET PUNCH PRESSES

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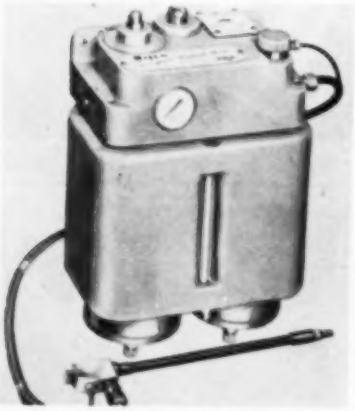


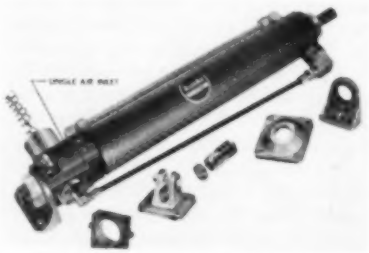
Spraymist Coolant Equipment Offered in Compact Unit

All necessary elements are provided in a single unit—air filter, trap, regulator and gage, solenoid-valve and conduit box, pressurized coolant reservoir and filter.

Solenoid valve connected to machine circuit starts Spraymist when machine is turned on. Pressurized coolant reservoir permits mounting in any location without siphon-lift problems. The 1-gal-capacity unit (above) is commonly used on most production equipment; it is also available in an 18-oz capacity model.

Range of settings from superfine mist to heavy spray is possible with precision needle valve control; atomizing takes place in the jet tip. One unit can supply up to 10 or more jets by branching from existing lines.

Bijur Lubricating Corp, 151 W Passaic St, Rochelle Park, NJ

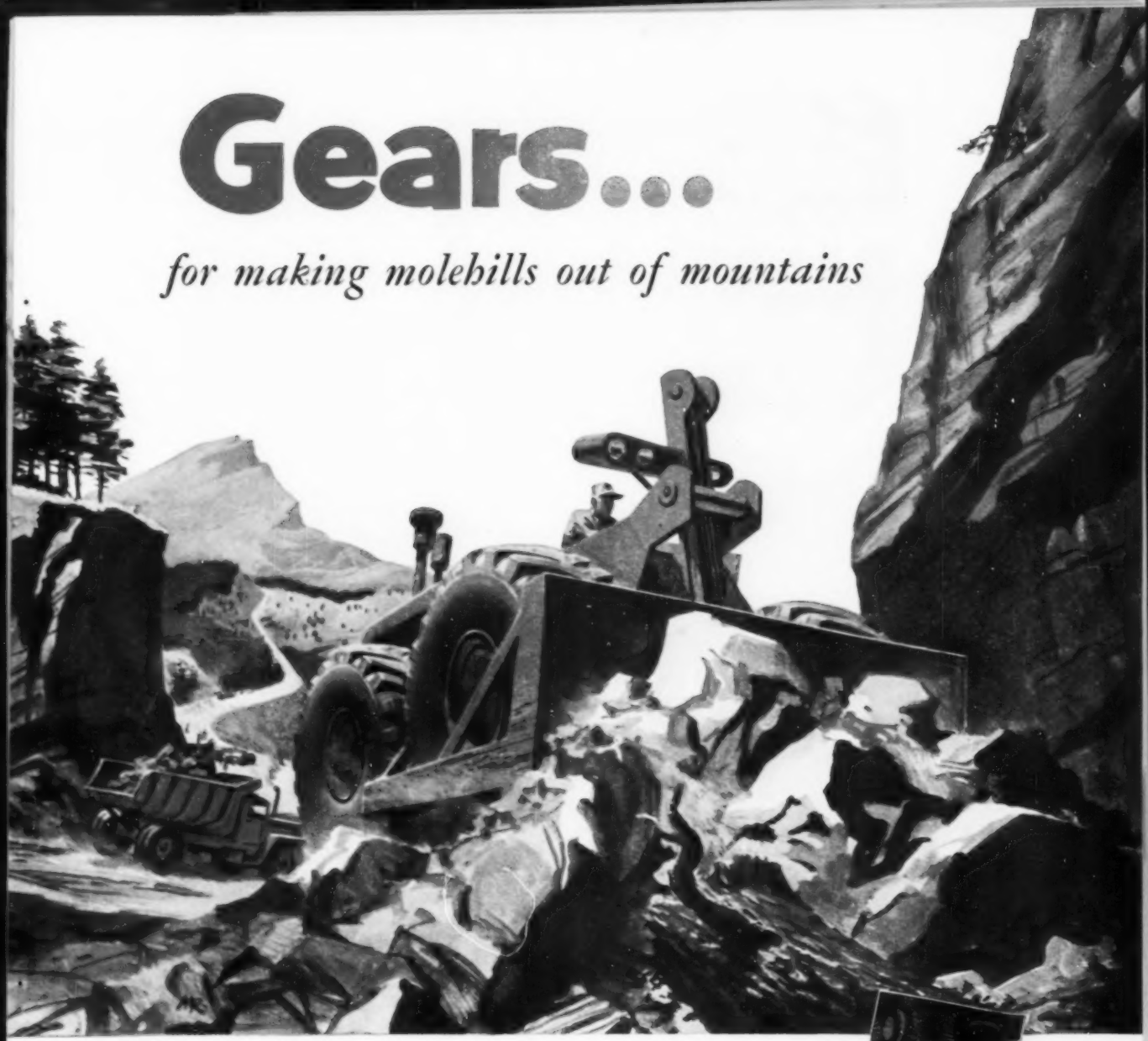


Allen Introduces New Line of Automatic-Return Cylinders

Four new lines of automatic-return and a new line of automatically-reciprocating air cylinders have been added to company's AllenAir line of power cylinders. The automatic-return cylinders are available for single control either by electric switch or bleeder valve and come with rods either normally retracted or

Gears...

for making molehills out of mountains



It is hard to imagine worse working conditions, and that is the very reason why the manufacturers of so many kinds of road building equipment install "Double Diamond" gears. Wherever the going is especially rough, wherever gears must give uninterrupted service on harsh, time-table schedules, you'll find our gears at work.

For low installed cost, for true operating economy and performance, and for buckling down to the hardest kind of service—nothing beats "Double Diamond."

Our salesmen are experienced gear engineers. Why not talk to one about your gear requirements?

May we send you a copy of this comprehensive catalog on the many gear types in which we specialize?

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AUTOMOTIVE GEAR DIVISION
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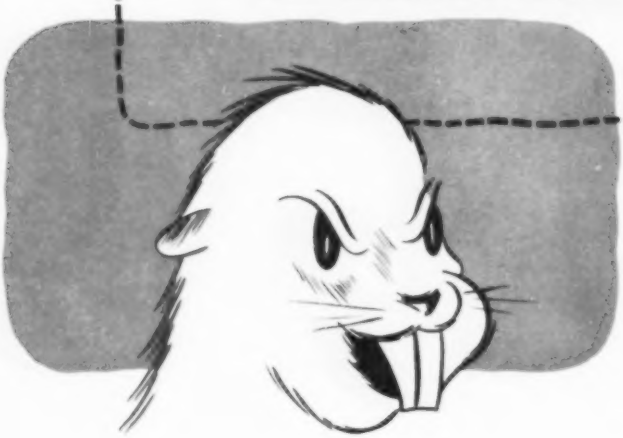
GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Putting Teeth into YOUR gear drives is our business



We mean *real* teeth – the kind you must have for quiet, smooth operation.

Teeth that are accurate in lead, profile and finish. Teeth that make your gears do the job they are designed to do.

We know gears! And we have the latest equipment to make, inspect and *guarantee* custom gears – of all types.

Shaving capacity to 39".
Tooth Grinding to 25".
Involute charts furnished.

Let us quote on your requirements for custom gears and custom gear boxes.

CINTI® **GEARS,** *good gears only*

THE CINCINNATI GEAR CO.

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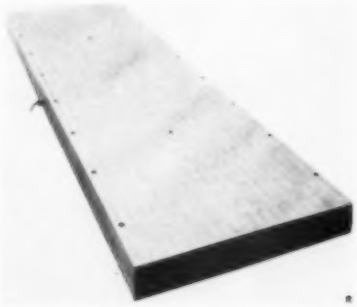
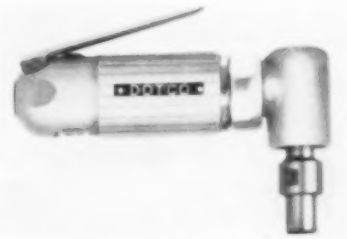
extended. The return control has been incorporated into the cylinder head, so that a single actuation of the controls sends the rod to full stroke and then returns it. These cylinders are available for 8, 110 or 220-v operation and come in 1½, 2, 2½, 3 and 4-in.-bore sizes.

Also available are automatically-reciprocating models, which require but one air connection to the cylinder valve unit and are controlled by a standard shut-off valve. Bulletin available.

A K Allen Co, 255 E 2nd St, Mineola, LI, NY



ELECTROMAGNETIC CHUCK, Type H, is reported to offer superior holding force to accommodate present day feeds and speeds. Because of the symmetry of the design, setup time is said to be minimized. Available in rectangular sizes up to 36 x 120 in., chucks are easily grouped in tandem to make larger installations—*O S Walker Co, Inc, Worcester 6, Mass*



Pneumatic Die Grinder Has Speeds to 12,000 rpm

Dotco Model 1AE for contour finishing of dies, molds, and patterns can be used for finishing hard-to-reach areas because of its angle-drive design, compactness, and small size.

Unit can be used with flexible disk holder with contour sanding disks up to 4 in. in dia, carbide burs, or with mounted wheels of various sizes. An Erickson 300 Series collet

(Continued on page 182)

Mr. W. J. McCuen says: "Lint-free Scott Wipers are ideal for wiping glassware in our lab. They're soft enough for personal wiping—hands and faces—and yet tough enough for such jobs as wiping switchgear units, wiping machine shop lathes, wiping heavy gate valves, and cleaning paint brushes!" Perf-embossed Scott Wipers are also specially treated for extra wet strength.

People buy Scott Wipers for many reasons:

Sinclair reduces minor injuries, saves time, with Scott Wipers!

At Sinclair Refining Company, Marcus Hook, Pennsylvania, 2-ply paper Scott Wipers are used throughout the plant. They store easily in minimum space, eliminate the costs of "return and exchange," and please employees. But a big factor, in the eyes of management, is *employee safety*. Mr. W. J. McCuen, Assistant General Foreman—Storehouse, reports: "These disposable wipers have cut down on minor injuries and lost time. Employees can't cut themselves on clinging chips or foreign particles, using Scott Wipers fresh from the box!" Sinclair has seen a substantial savings in wiping material costs, too . . . with paper wipers reducing (and in some departments eliminating) the number of cloth wipers being used!

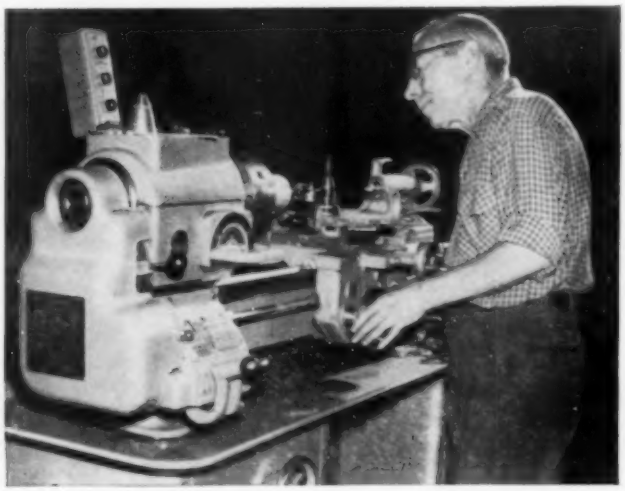
SCOTT PAPER

Get complete facts and figures on Sinclair as well as other case histories close to your own type of operations! Just call your Scott distributor—in the Yellow Pages under "Paper Towels." Or write: Scott Paper Company, Dept. AM-83, Chester, Pennsylvania.

Maker of the famous Scott paper products you use in your home. See "Father Knows Best" and "The Gisele MacKenzie Show" on NBC-TV.

DELTA INDUSTRIAL

DELTA 20" DRILL PRESSES are built to give you machine tool production capacity with power tool flexibility. Massive construction and rugged power make the Delta 20" a heavy-duty tool. Available with hand or power feed, choice of No. 2 or No. 3 Morse taper spindle. 28 models include floor, bench, multiple spindle and overhead types. Production tables, heads and columns available as components.



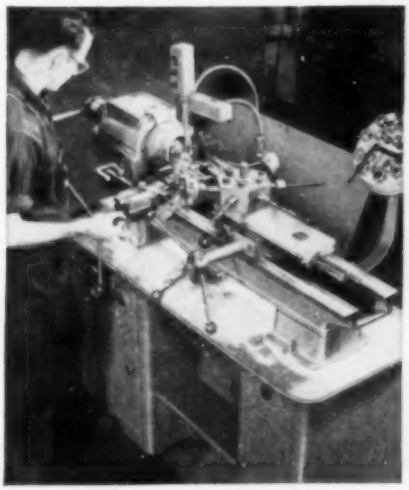
DELTA 11" METAL LATHES offer exclusive Delta Quality features such as massive head stock construction, perfected variable speed drive, unique 4-position drive selector and many more. Both 4 ft. and 5 ft. bed models available with flame hardened bed. And you get the double versatility of a ram-type turret lathe, when you add production accessories for precision multiple machining jobs.

A proved way to cut your costs

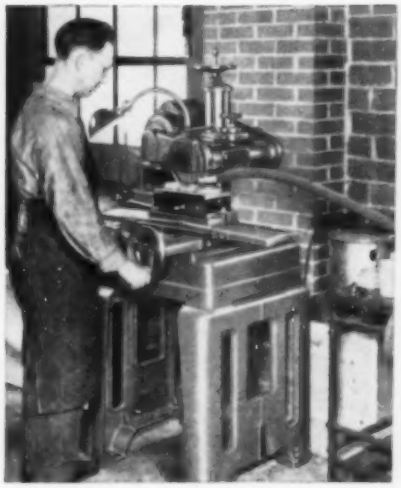
DELTA 17" DRILL PRESSES in over 70 models enable you to make your own single or multiple spindle set-up for drilling, counterboring, reaming and tapping jobs. Finest in their class, they are engineered for precision work and built for long life with low maintenance costs. Standard or power feed, high or slo speed and key chuck or tapered spindle available in floor, bench and multiple spindle models.

DELTA CUT-OFF MACHINES for fast, smooth, accurate cuts are speeding production and improving quality in tool rooms, maintenance departments and on production lines. Work head pivots for easy mitering. All belts, pulleys, cutting wheels or blades are fully enclosed for maximum safety. Whether you do wet abrasive or dry abrasive cutting, or cut non-ferrous metals or wood—you choose the model that's right for your job.

PRODUCTION TOOLING



DELTA HAND SCREW MACHINES fill the production gap between standard engine lathes and expensive, automatic screw machines . . . and at lower cost than any comparable machine. Bed turret, double tool post cross slide and lever type collet closer are *standard equipment*. Delta Quality features throughout assure lasting precision on multiple machining jobs.



DELTA TOOLMAKER® GRINDERS perform three precision grinding operations—surface, chip breaker and tool and cutter grinding. And with Delta 6" tool grinders, 7" standard grinders and 2½" belt grinders you have a complete line of safe, accurate, low cost grinders for every shop need.

DELTA 14" BAND SAWS These versatile, low cost machines give you eight cutting speeds—ranging from 40 fpm for metal to 3000 fpm for wood—using a *standard* motor. They enable you to cut stainless steel, armor plate, high speed steel, cast iron, alloy steel and dozens of other materials including woods and plastics. Available with steel or cast iron stand.

on every metalworking job

DELTA 15" DRILL PRESSES offer such Delta exclusives as six spindle adapters, "universal" hand feed, counterbalanced belt guard . . . plus big, machine tool ruggedness and proven production dependability. Delta 14" utility and 14" Super-Hi Sensitive Drill Presses also available in many models.

See Delta Industrial Tools at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages.

Thousands of metalworking plants across the country are cutting costs by using Delta Industrial Tools to supplement or replace expensive, special-purpose machines. Here's why: Delta tools are ruggedly built to withstand hard, continuous wear—they offer precision performance to meet the highest production standards—yet they cost less to buy, less to operate, and less to maintain. Completely portable, Delta tools can be moved in and out of production lines to relieve bottlenecks. And any plant can have inexpensive, automated operations through the combination of versatile, standard Delta components and automatic control devices.

Because Delta is the world's most *complete* line, you can choose the *right* tools for the biggest savings on *your* jobs.

Get all the facts on how YOU can cut costs with Delta Industrial Production Tooling. Write for FREE Delta Industrial Catalog to: Rockwell Manufacturing Co., Delta Power Tool Div., 618-C N. Lexington Ave., Pittsburgh 8, Pa.

DELTA INDUSTRIAL TOOLS

another fine product by

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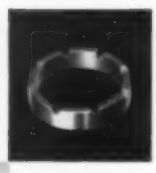
a new expanded field of

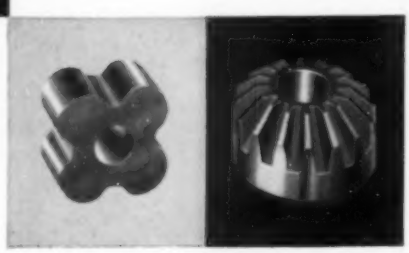
BEARING DESIGN and APPLICATION

The inauguration of Bunting's new facility for engineering and manufacturing bearings and parts of Sintered Powdered Metals opens a wide new area of opportunity to all mechanical industry.

Sintered Powdered Metal Bearings and parts offer real economies in design. Bunting Engineering and manufacturing skill and traditional technical responsibility assure your most advantageous use of this material.



A competent group of Bunting Sales Engineers in the field and a soundly established Product Engineering Department put at your command, comprehensive data and facts based on wide experience in the designing and use of both Cast Bronze and Sintered Powdered Metal Bearings and parts.



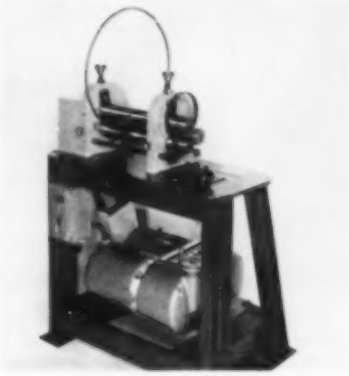
● *Write for catalogs and your copy of the new 24 page Bunting Engineering handbook of Sintered Powdered products and their composition, manufacture and application.*

Bunting®

BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL

chuck is standard. Tool is cool-running up to its max free-running speed of 12,000 rpm. Additional advantages of the 4-vane rotary air motor design are greater torque and horsepower. Unit is equipped with lever control.

Doeden Tool Corp, Sherwood, Ohio



Ring Rolling Machine Features Variable Speed Drive

This machine can be used for making wire, strip metal or sheet metal rings and arcs. Large diameter rings are rolled on the inner rollers; smaller ones are rolled on the outer rollers and can be taken from machine while the machine is still running.

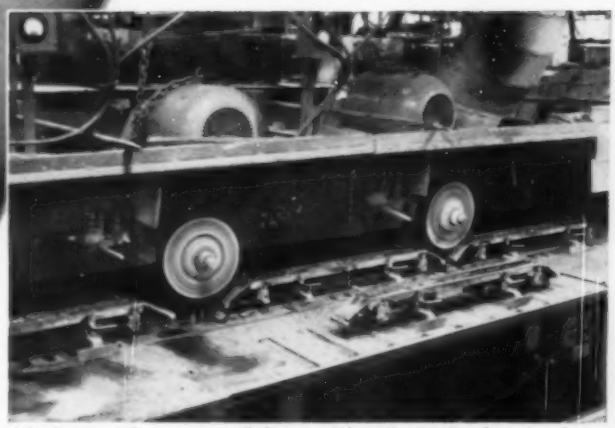
Power is supplied by a 1-hp Reeves Vari-Drive through a chain drive. Replaceable bronze bushings are used throughout. All rolls are 2 in. in diameter and are hardened and ground. Roll gap settings are made with simple adjusting knobs.

M J Lubow, 121 W 64 St, New York 23, NY

Compact Chilling Machine Has Large Chamber Capacity

Model 5L-2, a 5-cu-ft low-temp chilling and refrigeration unit requires 44 x 30 in. of floor space; chilling chamber has free working area of 30 x 18 x 16 in. deep. Com-

OSBORN®



A leading manufacturer uses 16" diameter Osborn Fascut® Brushes, operating at 1700 rpm, to finish automotive trim parts prior to plating.

Smooth start for a perfect finish

THE bright smoothness of metallic trim—adding a final touch of beauty to thousands of products—must start with an equally smooth surface prior to plating.

Makers and users of trim parts find Osborn power brushing methods ideal for removing draw marks, blending imperfections into an unmarred plating surface, materially reducing rejects.

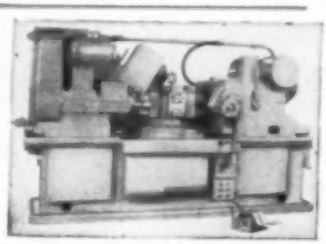
An **O**sborn **B**rushing **A**nalysis, made in your plant and at no obligation, will point out the many ways Osborn power brushing can improve your metal finishing operations. Write *The Osborn Manufacturing Company, Dept. C-68 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

BRUSHING METHODS • BRUSHING MACHINES • POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

Single set-up covering
ALL finishing operations...

MEANS GREATER ACCURACY with GOSS DeLEEUW



AUTOMATIC CHUCKING MACHINES

One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

pletely automatic machine incorporates oil separator, oil filter, safety controls, and overload protection.

Adjustable to maintain temperatures from –70 to –130 F, it is designed for production chilling or environmental testing. Accessories available include mechanical convection of air, observation window, recorder, heater for high-temp testing, casters, and triple cascade system to –200 F.

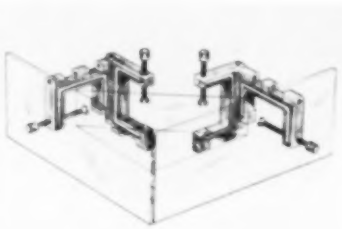
Harris Refrigeration Co, 308 River St, Cambridge, Mass

Frequency Converter Energizes High-Frequency Power Tools

This 60 to 300-cps frequency converter provides power for high-frequency power tools, grinder spindles, and electronic circuits. It is also a convenient portable source of high frequency for test and experimental work. The drive motor is an axial air gap unit with a speed 3600 rpm. The company's "No-brush" generator rotor is mounted directly on the vertical motor shaft; generator is in base, motor is mounted above. Input is 208/416 volts, 3-phase, 60 cycles; output is 360 cycles, 230 volts, 3-phase, 5 kva.

Unit measures 18½ x 13 x 13 in. and weighs 210 lb. Other ratings are available. Bulletin available.

Georator Corp, Manassas, Va



Interlocking Clamps Provide Nine Clamping Combinations

Designed to act as temporary jigs or lowcost fixtures, these Third Hand clamps resemble squared-off C-

BOSTON Gear adds NEW types and sizes to provide

SPROCKETS and CHAIN

in the full range required for drives from 1/4" to 2" Pitch

FROM STOCK!

NOW — you can meet any drive need — light to heavy duty — with standardized roller, block, or ladder chain and sprockets OFF-THE-SHELF from your BOSTON GEAR DISTRIBUTOR — AT FACTORY PRICES.

NEW CATALOG SC-3
lists all new types and sizes, and all other Sprockets and Chain in the big BOSTON Gear line. Includes helpful engineering data to simplify sprocket selection. For your copy, call your BOSTON Gear Distributor, or write Boston Gear Works, 60 Hayward St., Quincy 71, Massachusetts.

For nearest Distributor
LOOK UNDER "GEARS"
in the
'Yellow Pages'

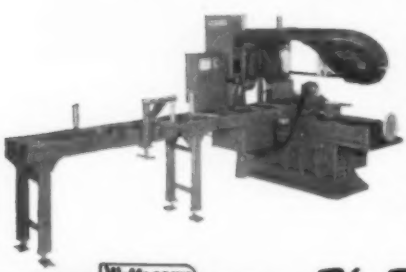
CALL YOUR BOSTON Gear DISTRIBUTOR

7124 "OFF-THE-SHELF" TRANSMISSION PRODUCTS **FROM STOCK** — AT FACTORY PRICES — ASK FOR CATALOG
Stock Gears • Sprockets and Chain • Speed Reducers • Bearings • Pillow Blocks • Couplings

THE **WELLS** MODEL **1200**
HORIZONTAL METAL CUTTING BAND SAW

Looking for a way to handle heavy duty production metal cutting? Focus your eye on a Wells Model 1200, the quality built, efficient, economical horizontal band saw. Ask your Wells dealer to show you one in operation. You'll appreciate its outstanding value. The Model 1200 has a rectangular capacity of 12" x 16" and rounds, 12¾" O.D. It incorporates such select features as controlled blade pressure to provide proper feed action and increased blade life . . . pushbutton operation and for greater safety, 110 volt control circuits. Also available with J.I.C. controls.

New Model 312 Roto-Veyor . . .



A brand new concept in automatic bar feeds. Designed specifically for use with the Wells Model 1200 Band Saw, the Roto-Veyor converts it into a heavy duty, completely automatic cut-off machine. Feed mechanism and stock clamping action is synchronized with the saw to provide accurate repetitive cutting. Improves saw efficiency, saves time, and reduces production cutting costs. Write today for Bulletin 265.

Wells SAWS
Wells®

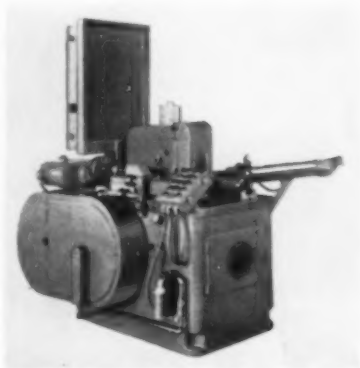
The Pioneers of Horizontal
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORPORATION
909 Taft Street, Three Rivers, Michigan

clamps. They are made so that they may be joined together back to back, top to bottom, in parallel, vertical and horizontal positions, or at angles of 45, 90 or 180 degrees—nine different combinations for each pair of clamps.

They hold any piece of metal or wood in any position for welding, fastening or machining. Clamps are easy to assemble for even the most complicated setup, yet are competitively priced with C-clamps. Made of forged steel, clamps have jaw openings from 2 to 6 in. Each set comes with a simple locking wrench. The screw has been copper plated to resist welding spatter and the shoe is removable for cleaning.

Aircompco Co, Edison, NJ

CARBIDE TIPPED EXPANSION REAMER, available in several styles and range of sizes, has accurately controllable expansion said to be always uniform throughout length of cutting blades. Cutting element is replaceable—*Staples Tool Co, 2352 Glendale-Milford Rd, Cincinnati 15, Ohio*



Grieder Tube Cutoff Machine Features Increased Capacity

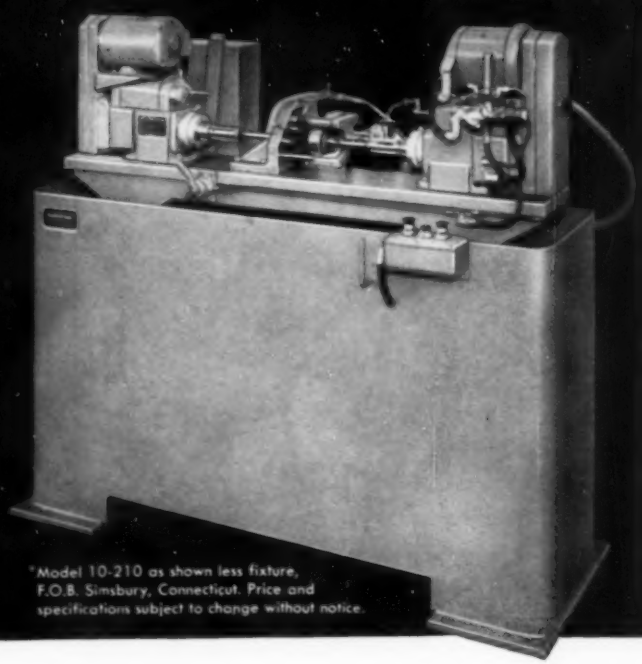
The range of tube sizes that can be cut on this tube cutoff machine has been increased from 2 in. to 2¼ in. OD to accommodate all sizes from most tube mills. Other improvements include an air-mist cutting oil

(Continued on page 189)

new

HARTFORD DOUBLE END MACHINE

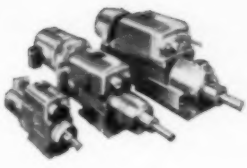
$3,565* Complete



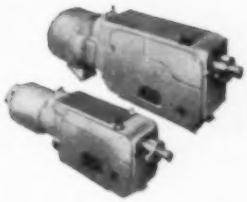
*Model 10-210 as shown less fixture, F.O.B. Simsbury, Connecticut. Price and specifications subject to change without notice.

- Opposed operations simultaneously
- Quick change of stroke, feed rate, spindle speed and unit position
- Handles parts up to 28" long
- Available with manual or automatic interlocked cycle
- Coolant tank, coolant pump, chip pan and coolant troughs integral with base
- Drill capacity to 5/16" in mild steel with 19-150 Unit
- Tapping capacity 3/8" with a maximum stroke of 1½"
- Use with small index table, manual or air clamp fixtures, hopper load devices or vibration feeders
- Adaptable to multiple spindle head applications
- Performs two operations per hole with index table
- Inexpensive, fast, flexible centering operations
- Available as basic machine — completely tooled or as separate components

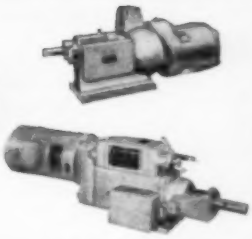
Rectangular Bases — 8" x 60" finished mounting pad accommodates a variety of drilling, boring or tapping units. Coolant tank with pump mounting flange, drain port, chip pan and large coolant troughs included. Adaptable to small index tables, air clamps or other part locators.



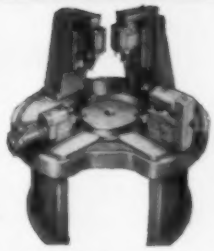
Automatic Drilling and Tapping Units — The Hartford Model 19-150 Quill Type Drill Unit is ideally suited as a working unit on the Double End Machine for production drilling, tapping, reaming, spot-facing, centering, milling, chamfering and countersinking. Other Hartford Units can be readily adapted also.



Automatic Cam Feed Drilling Units—Two models of these mechanical feed units are available. Designed for use with multiple head as well as single spindle applications, these electric clutch units are compact, dependable and fast cycling. They provide positive accuracy on long run jobs.



Automatic Lead Screw Tapping Units—No. 22 unit, above, features lead change through gearing from master lead screw. No. 19-175 unit, below, features variable quick advance stroke before starting lead screw spindle.



Other Hartford standard basic components including circular bases, straight post columns, tunnel columns and unit adapters can be combined with standard Hartford drilling and tapping units for assembly into production machines such as the 65" horizontal indexing machine shown above.

HARTFORD *Special*

Hartford also makes automatic Thread Rolling Machines, Special Machinery and the world famous Super-Spacer.

Machine Tool Division
THE HARTFORD SPECIAL MACHINERY CO.
2823 Homestead Ave., Hartford 12, Conn.

Send me complete information on Model 10-210 Machine and other machine components.

Name _____ Title _____

Company _____

Street _____

City _____ Zone ____ State _____

POP'S school of Filing

POP WON'T SAY HOW LONG AGO HE GOT HIS FIRST COPY OF FILE FILOSOPHY---
THE NICHOLSON PEOPLE HAVE SAVED AN AWFUL LOT OF MONEY FOR COMPANIES WITH THAT BOOK. SAVED GUYS WHO USE FILES A LOT OF WORK, TOO!
File Filosophy
FILE FILOSOPHY
DO NOT TAKE AWAY!
POP HAD A STACK OF THEM WHEN I CAME HERE 40 YEARS AGO!
GR

MAGICUT FILE—one of 6000 types made by Nicholson

We give you the facts and the file for every purpose

Our founder, William T. Nicholson, wasn't happy making the best files ever made back in 1878.

He found out that a lot of users weren't getting out all the work or all the workmanship he put in his files. Trouble was, there was no way to read and learn about filing.

So he wrote a treatise on files and their proper selection and use. Later we condensed this and published it as "File Filosophy." We've printed 19 editions since then, always adding to its fund of facts. Today, "File Filosophy" is the universally accepted authority on filing.

Founder Nicholson would be pleased at all of this. His company still makes the best files made . . . proudly stamps them "Nicholson" or "Black Diamond." With the help of the book he first wrote nearly 80 years ago, file users like you are getting the kind of results they want. When you want files or filing information, your helpful Industrial Distributor has the best in both.

Write us for a free copy of the *new* "File Filosophy."

Industrial Distributors provide the finest goods and services in the least possible time. Our files are sold exclusively through them.

NICHOLSON U.S.A.

NICHOLSON FILE COMPANY, PROVIDENCE 1, RHODE ISLAND

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BLACK DIAMOND U.S.A.

NICHOLSON and BLACK DIAMOND FILES

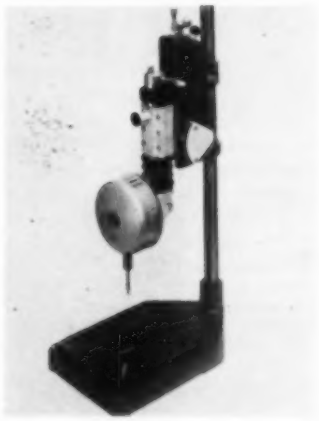
A FILE FOR EVERY PURPOSE

system to increase blade life, automatic lubrication and improved feed rolls. Machine can cut tubes at rates higher than 6000 pieces per hr. There is no distortion of the tube, and deburring is not necessary for most applications.

Grieder Industries, Inc, Bowling Green, Ohio

Box table is designed for radial drills, boring mills and other floor-type machines. It measures 30 x 24 x 20 in. and is priced at $325. Table is machined from a gray iron casting and is T-slotted.

Lagoe Oswego Corp, 45 E 12 St, Oswego, NY



Noiseless Ultrasonic Drill Cuts Holes of Any Shape

Mullard Mark II is a 60-w unit that operates at 20,000 vibrations a second so that it can barely be heard. Because of its reciprocating action it can shape square and crescent as well as round holes, and any form required. It can also be used for cutting, slicing, and blanking.

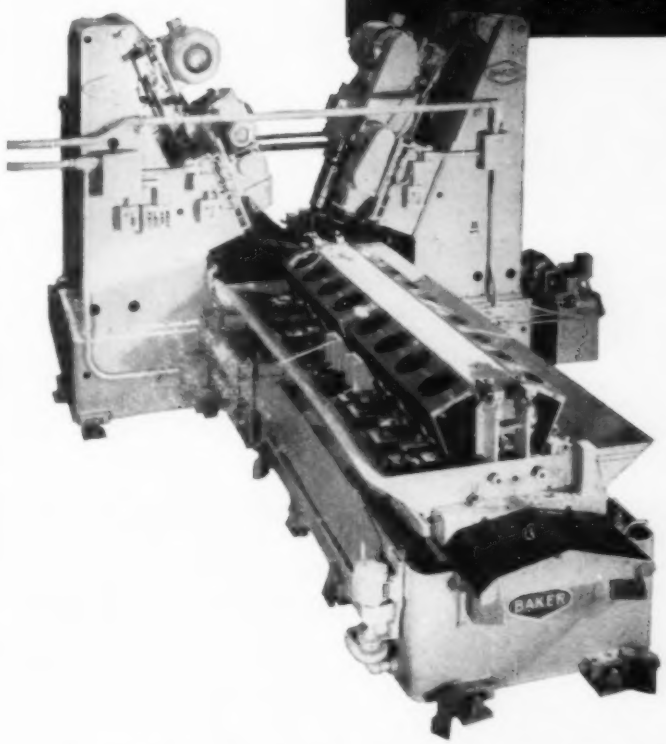
Machining accuracy and surface finishes are basically dependent upon size of abrasive particles. Surface finishes of 8 to 10 mu-in. are claimed; finer finishes can be obtained by using thinner abrasives. Very little pressure is required on work material and there is no stressing or heating, thereby eliminating distortion and deformation. Precision drill stand supplied with the equipment meets conditions required for machining accurate apertures from 0.005 to 0.75 in. Constant feed conditions are made possible by adjustable counter balancing systems.

Distributed by International Electronics Corp, 81 Spring St, New York 12, NY

BAKER

AUTOMATION

Best in the long run
Practical in the short run

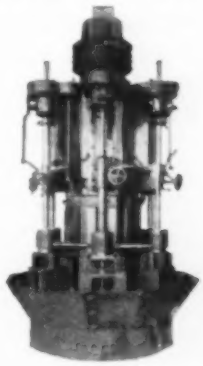


NEW BAKER SPECIAL

bores diesel engine cylinder blocks - automatically

The latest of a long line of Baker special machine tools . . . operations are rough and finish bore and counterbore 6 to 16 holes for cylinder sleeves; drill dowel pin holes.

Compare with the early Baker special "Rotary" below — the *man* walked around the *machine!*



BAKER BROTHERS, INC.
Dept. AM-38, Toledo 10, Ohio

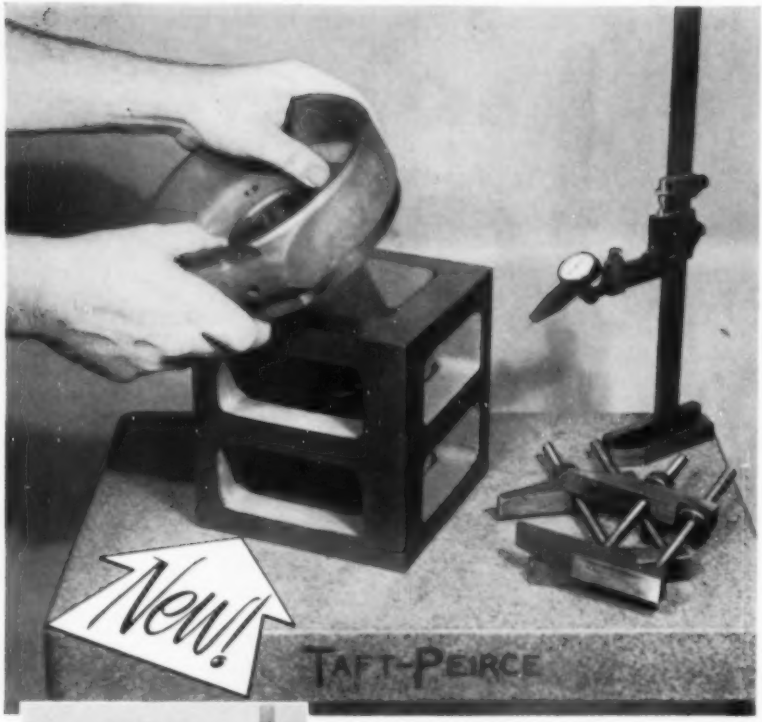
Send me data on automation with . . .
☐ Baker Specials ☐ Baker *standard* machines

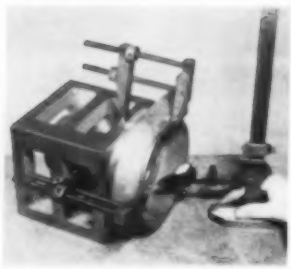
NAME AND TITLE

COMPANY

ADDRESS

CITY ZONE STATE





All-in-one Setup Tool!

This one-two-three series shows how a casting is held for inspection on the Box Angle Iron. 1. Workpiece is inserted and clamped in place; 2. Machined outer edge is indicated for parallelism; and then 3. Box angle is turned on side to indicate bore for squareness to outer edge.

Box Angle Iron

Saves Valuable Layout, Inspection and Machining Time

This unusually versatile Taft-Peirce tool serves as both a universal right angle iron and box parallel.

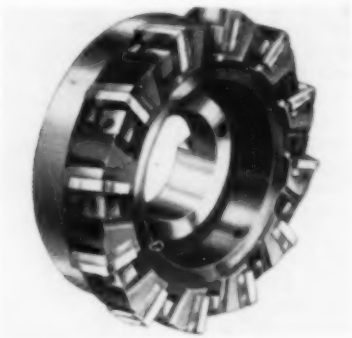
Four sides open for convenient work-clamping, and for clamping Box Angle Iron to machine table or surface plate. Two solid faces for use as right angle iron.

Highly accurate and made from close-grained cast iron, heat treated. Working surfaces are precision ground with overall dimensions held to size within .0005″, opposite sides parallel within .00025″ and adjacent sides square within .0005″.

The Taft-Peirce Box Angle Iron will quickly pay for itself. Order one today and see for yourself. Send for T-P data sheet ST-002.

TAKE IT TO TAFT-PEIRCE T P

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

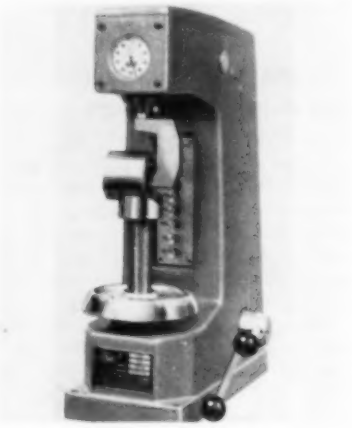


Viking's Line of Milling Cutters Has Double Negative Rake Angles

Inserted blade shell end mills and face mills, using ½ and ¾-in.-sq standard throw-away carbide inserts have been introduced (initially) with double negative rake angles.

Hardened HSS anvil, located in back of cutting insert, is fastened to cutter body by a retaining screw to prevent disassembly during indexing or replacement of the insert. Anvil also provides a hard, ground seat for the insert, and can be replaced. Dual-threaded screw-actuated wedge provides easy indexing. Bulletin 121557C available.

Viking Tool Co., 1000 Nichols Rd., PO Box 471, Shelton, Conn



Universal Hardness Tester Checks in Eight Ways

Frank (German) unit incorporates an arrangement whereby eight different loads are selectively available by pushbutton control. Tests include Rockwell C by Brale penetrator; Rockwell B by 1/16-in. steel ball; Brinell by 2.5, 5, and 10-mm steel balls; Vickers by 136° diamond penetrator.

All operating parts are fully en-

Eye Protection

482A
VINYLITE GOGGLE

Larger face mask — greater protected area

Deeper cup — increased lateral protection — easily fits over all safety glasses and personal glasses.

Modified nosepiece — aids comfort, facial fit.

It's AO's New "482A"!

(Vinylite Mask Goggle)

Once again American Optical engineering and research make a good product even better! This light, comfortable flexible mask goggle offers the trustworthy, *optically correct* protection which has made it so popular PLUS the new features above. It's a better buy than ever! Recommended for protection against flying particles striking from any direction in babbitting, chipping, cutting rivets, light grinding, on hand or machine tool work, or where spark-explosion hazards endanger. Your nearest AO Safety Products Representative can supply you.

Quick Facts

Lens — Interchangeable, one-piece acetate, easily removed and replaced. Curved slightly for increased field of vision. Provides greatest worker comfort, safety, efficiency.

Frame — Soft, face-hugging vinylite provides maximum flexibility and full protection.

Headband — Elastic, easily adjustable.

Color — Clear frame, clear or green lens. For green frame, clear or green lens specify Catalog No. 483A.

Always insist on the AO Trademark on Lenses and Frames

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
Branches in Principal Cities

8 for 1 THIS WENDT-SONIS TOOL HOLDER

• • • PLUS ONE INSERT GIVES YOU UP TO 8 CUTTING EDGES

SAVE ON INVENTORY With the wide range of Wendt-Sonis carbide grades and shapes available in throw-away inserts and chip breakers, one tool holder and a stock of inserts can do the work of a much larger stock of brazed single-point tools.

SAVE ON GRINDING With the much lower cost of throw-away inserts, expensive diamond-wheel regrinding is unnecessary.

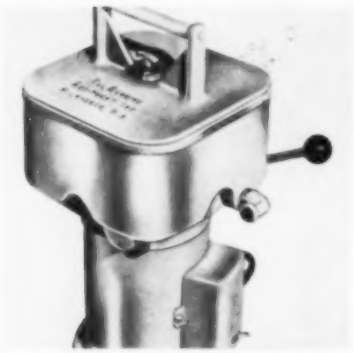
SAVE ON MACHINE DOWN TIME Because precision-made Wendt-Sonis inserts can be indexed to ±.001", inserts can be replaced without removing tool holder from machine.

FREE TECHNICAL SERVICE in connection with your tooling problems is available from the Wendt-Sonis representative in your area. Ask him for detailed information on Wendt-Sonis tool holders and throw-away carbide inserts or write for Catalog 57-A. Address Department AM-358.

WENDT-SONIS COMPANY
Hannibal, Missouri • Rogers, Arkansas

closed. Dial gage provides automatic zeroing for the minor load. Oil brake permits regulation of load speed, and two co-axial ball handles insure max operating speed. Variety of supports and other accessories are available for different applications.

Distributed by Opto-Metric Tools, Inc, 137 Varick St, New York 13, NY

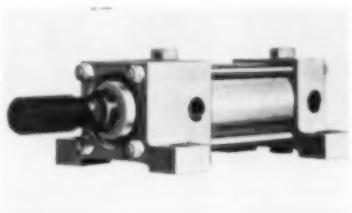


Portable Hydraulic Motor Pump Rated for 10,000-psi Pressure

Unit weighing 65 lbs is rated for 10,000-psi intermittent and 5000-psi continuous duty delivering 80 cu in. of oil per minute.

In addition to use with hydraulic benders, pipe pushers, knock-out punches, hydraulic jacks, it can be installed and adapted to give fast, continuous power to existing equipment. Typical applications include pressing, pushing, or pulling bushings, bearings, shafts, pump pistons, arbor presses, lifting operations, pressing small ceramics and powdered metal parts. Model is driven by a standard ½-hp, single-phase, 60-c, 1750-rpm, 110-220-v motor.

Tal Bending Equipment, Inc, Milwaukee 2, Wis



HEAVY-DUTY CYLINDER, designed for automation applications, meets automotive manufacturers' heavy-duty cylinder standards. It is capable of 1000-psi hydraulic service with a minimum 4:1 safety factor. All metal parts are treated for corrosion resistance—*Petch Mfg Co, 463 York St, Detroit 2, Mich*

NEW! "Feather-touch" PUSH-to-TEST PILOT LIGHT

Added to Square D Oil-Tight Pushbutton Line

Completely oil-tight, even when depressed

Pressure connections eliminate internal wires

Positive contact "feel" in test position

No additional panel space required

Choice of 6 color caps

Full range of voltage ratings

Mounts interchangeably with oil-tight pushbuttons and selector switches

OIL-TIGHT OPERATORS

Standard Button

Mushroom Button

Selector Switch

Coin-Operated Selector Switch

Key-Operated Selector Switch

Selector Pushbutton

Stop Button Lockout

Start Button Lockout

Maintained Contact Attachment

Selector Switch and Pushbutton Lockout

NEW!

4-Position Joystick Operator

Wobble Stick Operator

Neoprene Cap

Here's why Square D Pushbuttons are preferred —by those who *build* machines—and by those who *buy* them!

Easy to use • Operators require only a single mounting hole for quicker installation. Pressure wire connectors mean simplified wiring.

Longer lasting • All-metal operator construction, anodized aluminum buttons, mean greater mechanical life. Melamine contact blocks with double-break silver contacts assure longer electrical life.

Wide flexibility • Any operator can be used with any contact block to meet all your requirements.

Small size • Only a minimum of panel and back-of-panel space is required.

Variety of contacts • Contact block arrangements include single-pole double-circuit, duplex double-circuit, tandem duplex, three-position duplex, and overlapping contacts.

• • •

FOR COMPLETE INFORMATION on oil-tight pushbuttons, send for Bulletin 9001-T to Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

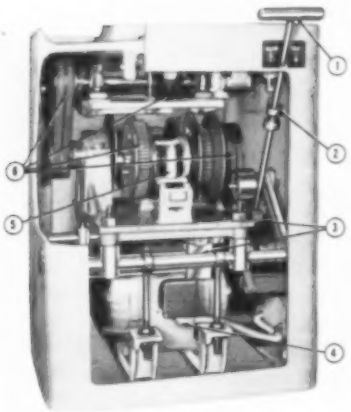
SQUARE D COMPANY

SHELDON *Variable Speed* PRECISION LATHES

CHICAGO U. S. A.

. . . any speed INSTANTLY*

**Spindle speeds changed at 200 r.p.m. per second. Built-in tachometer permits accurate selection of speeds from 200 to 2000 r.p.m. in direct drive–40 to 300 r.p.m. in back gear.*



(1) T-Handle Speed Selector
(2) Micro-Switch Direction Control
(3) Speed Change Mechanism
(4) 2 H.P., Three Phase Motor
(5) Belt-tension Adjustment
(6) Multiple V-Belts

This new lathe instantly meets every changing speed requirement in the tool room, or quickly sets and holds to any prescribed speed for production runs.

Rugged, Heavy-duty Variable Speed Drive—an oversized unit with double V-belts throughout that delivers positive full-power to the spindle.

High Spindle Speeds—from 200 r.p.m. to 2000 r.p.m. (direct drive), from 40 r.p.m. to 300 r.p.m. in back gear.

Instant and Automatic (power driven) Speed Selection—Only 9 seconds to change from low to high speeds in either direct drive or backgear. Speeds are changed automatically when T-handle is lifted or pushed into engagement.

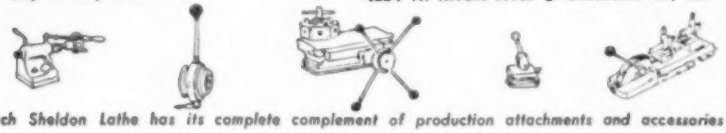
High Horsepower at All Speeds—Because the drive unit is oversized, it has larger belts which deliver maximum gripping power at all speeds. A 2 H.P., three Phase motors recommended.

Additional lathe features: Zero Precision tapered roller spindle bearings, 54 pitch gear box, heavy cast pedestal, tool-room accuracy. Optional accessories include hardened bed ways, L00 long taper key drive or 4" D1 Camlock spindles.

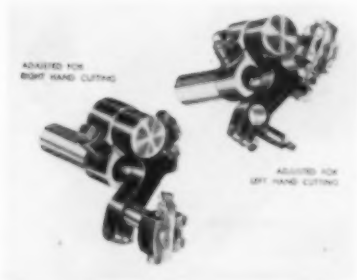
Sheldon Precision Variable Speed Drive Lathes are available in 11" or 13" Swing. Model WM-56-P (Illustrated) less motor and switch, $1,944.00 F.O.B. Chicago. Other 10", 11", and 13" Sheldon Precision Lathes from $898.00 up. Also 13" and 15" Sebastian Geared Head Lathes, Sheldon Milling Machines and Sheldon Shapers.

Write for Catalog

SHELDON MACHINE CO. INC.
4234 N. KNOX AVE. • CHICAGO 41, ILL.



Each Sheldon Lathe has its complete complement of production attachments and accessories

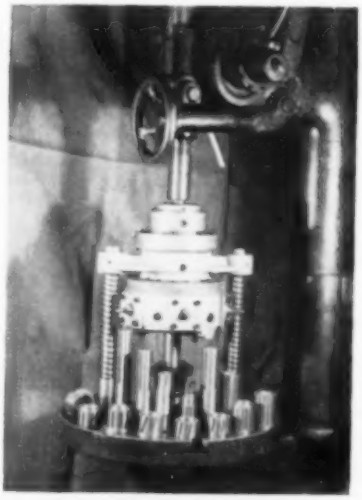


Combination Swing Tool Cuts Right or Left

Combination swing tool designed for use on turret lathes and screw machines permits straight, taper, or irregular turning when cross-slide tools are in use for other operations. It can be easily changed for RH or LH cutting by moving the holder from one location to the other and using the required blade. Two high-speed cutting tools are furnished with the unit.

Construction is of heat-treated alloy steel for max strength. All holes are ground for accurate alignment.

R & L Tools, 1825 Bristol St, Philadelphia 40, Penna

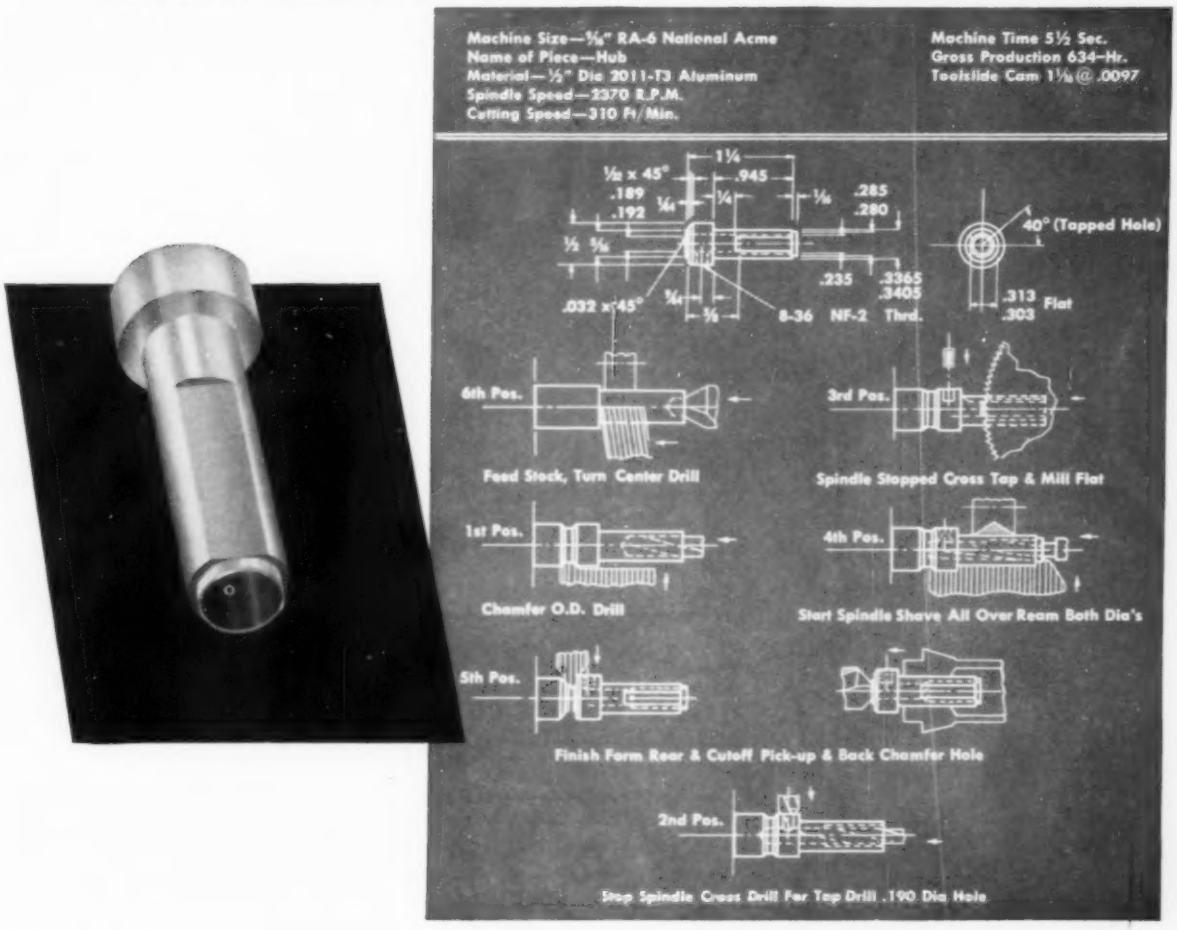


Splining Head Permits Drillpress To Cut Multiple Splines

Splining head, called the Universal Cost Cutter, permits an ordinary drillpress or engine lathe to cut multiple splines or flutes, straight or spiral, on a short run or production basis. By substituting an off-center cutter holder instead of the conventional type shown here, all types and sizes of 3-, 4- and 6-fluted spiral taps, end mills, counterbores, spotfacers, and reamers can be fluted.

The tool can be used singularly or

BETTER MACHINING STARTS WITH ALCOA SCREW MACHINE STOCK



Machining time of this part was cut 59 per cent with Alcoa Aluminum

When a famous machine tool builder switched a heat regulator part to Alcoa® Aluminum Screw Machine Stock, production went up, machine time went down, resulting in lower costs.

This hub, for example, is now turned out in 5.5 seconds, including drill, tap, mill flat, ream to burr and chamfer. Previous time with leaded steel: 13.6 seconds.

Alcoa Screw Machine Stock turns at remarkable feeds and speeds—1,000 ft/min. is common. This really pays off when the part gets complicated. In the tooling layout above, notice the cross drilling in the 2nd position and cross tapping and milling in the 3rd position.

Find out more about Alcoa Aluminum's machinability, better finishes, lighter weight. Here are three ways to do it:

- **Meet Tom Conroy,** Alcoa's screw machine specialist and field consultant. He will be glad to demonstrate aluminum's machining advantages. See coupon.
- **Send for free book,** *Alcoa Aluminum in Automatic Screw Machines.* It's a valuable procedures manual written for production men.
- **Ask for immediate stock delivery** by calling your nearest Alcoa sales office or Alcoa distributor.

ALCOA ALUMINUM
SCREW MACHINE STOCK
ALUMINUM COMPANY OF AMERICA

"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

Aluminum Company of America
868-C Alcoa Building, Pittsburgh 19, Pa.

Yes, I'd like to—

☐ hear from Tom Conroy.

☐ have a copy of *Alcoa Aluminum in Automatic Screw Machines.*

Name _____

Position _____

Company _____

Address _____

City _____ Zone _____ State _____

Want better Service on STAMPINGS?

...then count

Our ability to use the best of *three* stamping techniques, each our own exclusive development, assures lowest possible cost on any quantity—one to a million or more.

1 **A FEW PIECES—at Experimental or Pilot Stage**

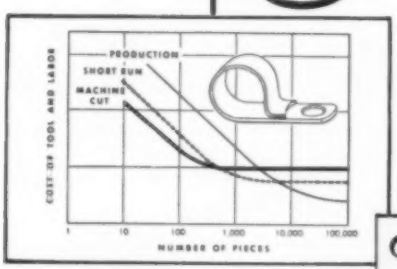
NO DIES! Our machine cut method, applying custom-built slitters, cutters, saws, files and stock punches—PLUS special techniques and skills—produce these small quantities at very low cost.

2 **SHORT RUNS**

TEMPORARY LOW-COST TOOLING! To produce something more than a few, but less than high production quantities, our simple contour dies—PLUS special purpose presses – keep costs low.

3 **PRODUCTION RUNS**

MODEST DIE CHARGES on larger quantities! Here is where our regular production tooling applies to advantage...to deliver high quantity Stampings, and at lowest possible unit cost.



You can rely on it...WE LOOK AT ALL THREE – then determine the best method for fast, efficient, low-cost service. Let us quote on your next Stampings job.

Free 12-page booklet shows how to save on stampings... write for it.

STAMPINGS DIVISION

"One Piece or a Million"

3103 Union Street, Glenbrook, Conn.

LAMINATED SHIM COMPANY, INC.

in multiple setups, and it will operate equally well in either the horizontal or vertical position. Capacity ranges from ¾ to 3½ in. Bulletin available.

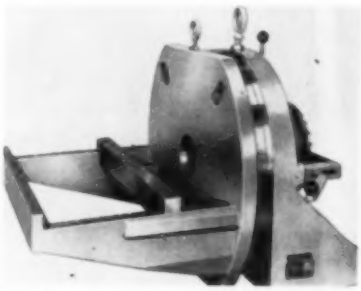
Earle G. Boyer, PO Box 4909, Philadelphia 19, Penna

Tool and Gage Cabinet Holds 1092 Items in 2.9-sq-ft Area

Cabinet, occupying only 2.9 sq ft of floor space, provides up to 70 sq ft of storage area.

Individual tool compartments with masonite sides and oil-resistant liners assure protection against chipping or nicking of items and provide dust-free storage. Standard single depth drawers have 39 compartments for tools up to 1¼-in. dia; double depth drawers have 14 spaces for tools up to 2½-in. dia; dividers are adjustable to provide varied compartment sizes. Three models are available, all mounted on casters.

M & S Equipment Co, 380 Darwin Drive, Snyder 26, NY



INDEXING TRUNNION Model 300 for larger, heavier work loads is particularly suited for heavy-duty radial drills and boring mills. Face plates up to 30 in. in dia may be used; hollow spindle with 2-in. ID can be supplied —*Johnson & Bassett, Inc, Worcester, Mass*

How DoALL's "Continuous SERVICE" insures profitable operation with DoAll Machine Tools

7-point program of interest to all plant executives

To keep your DoALL machines producing at the highest possible profit, The DoALL Company offers a 7-point User-Help Program—far beyond any other service in the industry.

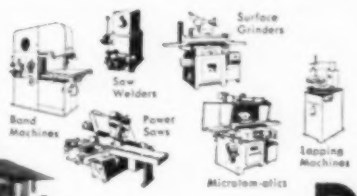
1. **FREE INSTALLATION SERVICE** to assure correct setup and full protection during initial operation.
2. **FREE OPERATOR TRAINING** certifies every operator you assign. In addition to personal instruction, special help includes "tip-sheets," wall charts and handbooks on latest techniques.
3. **FREE MACHINING ANALYSIS** is our specialty to keep your DoALL machines at full efficiency as new materials, new jobs and special requirements develop in your production.
4. **FREE MACHINE FIXTURING** helps to obtain peak performance in production of duplicate parts. Service includes sketches, recommending fixtures proved on similar jobs. Saves your time and money . . . prevents costly, needless experiments.
5. **FREE JOB-SPOTTING** within your plant keeps your DoALL machines busy. We can evaluate many jobs you may have overlooked—jobs your DoALL machines can do at lower cost.
6. **FREE MACHINE INSPECTION** — periodic inspection includes minor adjustments and reporting signs of wear—with timely tips to correct these conditions. Written Certificate of Inspection is furnished.
7. **DoALL PACKAGE SERVICE** provides a uniform, high-quality service at lowest possible costs from basic overhaul to production maintenance and modernization. Safeguards your DoALL machine investment . . . assures continuous profitable returns.

These exclusive services are administered by over 200 factory-trained engineers, one of whom is located *near* your plant.

CALL TODAY FOR FREE MACHINE CHECKUP

Ask your nearby DoALL store to give your DoALL machines a complete inspection and operation test—free of charge!

This is a typical DoALL Store



THE DoALL COMPANY, Des Plaines, Illinois

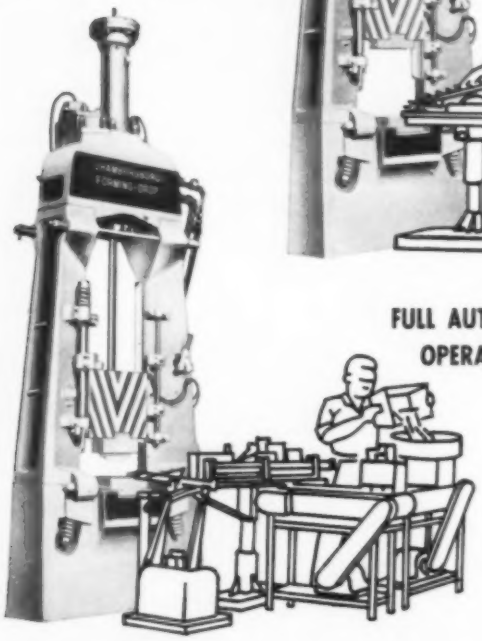
S-1

CHAMBERSBURG'S *NEW* FORMING DROP

AN ELECTRICALLY CONTROLLED GRAVITY DROP HAMMER PERMITTING USE OF AUTOMATIC FEEDING DEVICES–

MANUAL OPERATION

SEMI-AUTOMATIC OPERATION



FULL AUTOMATIC OPERATION

THIS NEW HAMMER, the result of original research and development by the Chambersburg Engineering Company, is especially designed for precision blow control and the accommodation of automatic feeding devices to perform such operations as forming, embossing, coining and re-striking in a single die impression.

Precise blow control is achieved by maintaining close pressure tolerances on the air supply and by the fine adjustment of a regulating valve on the hammer's exhaust system. These two features combined in a Chambersburg-designed hammer structure result in a tool which offers faster, safer, effortless and more accurate production in operations requiring a single blow in a single die impression.

The Forming Drop may be arranged for manual stock handling with a standard treadle operation or mechanical feeds can be engineered and installed to suit a variety of jobs. Utilizing suitable hoppers, sorting and orienting equipment in combination with and synchronized to the hammer, many jobs can be completely mechanized.

Consult with Chambersburg engineers regarding the application of the Forming Drop and automatic feed to your job—or write for Bulletin 73-L-7.

CHAMBERSBURG

THE HAMMER BUILDERS

CHAMBERSBURG ENGINEERING CO.

Builders of THE IMPACTER "FORGING IN MID-AIR"

CHAMBERSBURG, PENNSYLVANIA

Thomas Hollis, Jr, (left) has been named general manager of the newly established Cutting Tool Division of Brown & Sharpe Manufacturing Co. **Herbert H Upton** heads the recently organized Hydraulics Division. He will continue as president of Double A Products Co, Manchester, Mich, subsidiary

James Jarvie has been named general manager of Ex-Cell-O's industrial sales organization in Canada. He will supervise operations in London, Ont, and at Colonial Tool Co, subsidiary in Windsor

NAMES IN THE NEWS...

M A Chambers has been elected president of National Machine Products Co, Utica, Mich. Formerly vice president and general manager (he will continue to serve in the latter capacity) he succeeds **John L Cook** who has retired.

Herbert E Elliot, formerly manager of hydraulic sales of Watson-Stillman, Division Farrel-Birmingham, Ansonia, Conn, is now associated with Loewy-Hydropress Div, Baldwin-Lima-Hamilton Corp, New York.

Robert E Kenngott has been appointed general manager of Machine Tool Sales Co of Dallas, a division of Tool Supply & Engineering Co, distributor of machine tools. He was formerly associated with Douglas Aircraft Co, Tulsa Div, as machine tool requirements engineer.

William K Creson, consulting engineer, and former vice president of Ross Gear & Tool Co, Lafayette, Ind, has been elected president of the Society of Automotive Engineers.

Steven S Gordon has been appointed vice president and general sales manager of Republic Gear Co, Detroit. He was previously director of sales.

Charles W Sanford has joined Crouse-Hinds Co, Syracuse, NY, as vice president, manufacturing. Formerly manager of foreign operations for Philco Corp, Mr Sanford succeeds the late **Albert H Clarke.**

Harold W Miller has been appointed general superintendent of car assembly, and **Myron B Ells** section supervisor, industrial engineering at the Plymouth main plant in Detroit.

William M Hankins, Jr., has been elected president of Bunting Brass & Bronze Co, Toledo designer and manufacturer of bronze alloy parts and bearings. Formerly head of the Fred W Kiemle Co, Toledo electric motor distributor, Mr Hankins succeeds **George H Adams** who has retired.

Leon B Rosseau, vice president and general manager of Ajax Electric Co, Philadelphia salt bath furnace manufacturer, has been elected president and treasurer to succeed **John E Haig** who will continue on a consulting basis. **H W Schrader,** production manager, has been elected vice president and controller.

John P Studebaker has been named president of Washington Machinery Co, Seattle. **Hil Berglund** takes over Mr Studebaker's former post as vice president.

Carl L Sadler (left), general manager of the Sundstrand Aviation Division of Sundstrand Machine Tool Co, has been elected a vice president of the company in charge of that division at Rockford, Ill. **Richard H Olson,** general manager of the former Aviation Division at Denver, Colo, has been elected a vice president of the company in charge of the new Sundstrand-Turbo Div which includes both the Denver operation and American Machine & Foundry's former Turbo Div at Pacoima, Calif, acquired recently by Sundstrand (*AM*—Feb 24, p144)

Henry Jessop, associated for many years with Composite Forgings, Inc, Detroit, has been named head of the new Special Machine and Fabrication Division, concentrating on heavy-duty special machines and automation equipment

FILTRATION *Engineered* TO MEET METAL WORKING NEEDS

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A Complete Line Including

MICRO-KLEAN

FIBER CARTRIDGE FILTERS

- **FOR COOLANT LIQUID SYSTEMS** . . . remove chips and grinding swarf from stream . . . insuring far finer finishes on surface and centerless grinding and machining operations.
- **FOR HYDRAULIC SYSTEMS** . . . remove solid particles that may damage equipment or cause malfunction.
- **FOR LUBE OILS** . . . insures protection against chips, swarf and other harmful particles accidentally introduced into system.
- **FOR PAINTING, FINISHING** . . . filter paint and air lines. Improve product appearance, protect against delays from clogged nozzles.

Two cartridge types — White Cellulose and Wool — provide filtration from 5 to 75 microns. Exclusive Cuno "Graded Density" feature *doubles* cartridge life . . . cuts replacement costs *in half!* A complete line of standard Cuno Housings is available for every application requirement.

* Only Cuno offers you a truly complete line that includes *several* distinct types of filter media. Cuno also offers a complete application engineering service through the Cuno Field Engineer conveniently located in your area. He is qualified to help you select the right filter type and model to solve your problems.

WRITE NOW FOR FULLY DESCRIPTIVE PRODUCT LITERATURE . . . *Free Micro-Klean Bulletins will be sent to you by return mail.*

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TELEPHONE: BEverly 7-5541

EDGE-TYPE, WIRE-WOUND, SCREEN, FIBER CARTRIDGE and POROUS METAL FILTERS

Filtration Engineers in Principal Cities

NAMES IN THE NEWS...

James W Allen has been elected vice president of Pacific Electric Motor Co, Oakland, Calif. He has been serving as manager of fabrication and repairs.

Hilliard W Paige has been appointed manager of the nose cone section (Atlas and Thor missiles) in General Electric's Missile and Ordnance Systems Dept in Philadelphia. He was formerly manager of nose cone systems and projects.

Frank Randall, vice president and general sales manager of Amperex Electronic Corp, Hicksville, LI, NY, has been elected president of the company.

Thomas Allinson has been appointed president and chief operating executive of Weston Instruments Division of Daystrom Inc, Murray Hill, NJ, as well as of Daystrom Systems Div, La Jolla, Calif, and Daystrom-Weston Industrial Div, Poughkeepsie, NY. New group is known as the Daystrom-Weston Co. Mr Allinson will continue as a vice president of Daystrom, Inc.

Georges Pourfillet, former assistant production manager of the Heckethorn Manufacturing Co, Denver, has been named supervisor of ElectroChemical production of Frank R Cook Co, Denver avionics firm.

Edward R Neumann has been appointed manager, Missile Products Division, Fruehauf Trailer Co, Detroit. He was formerly product sales manager.

Henry L McIntyre, formerly associated with Hiller Helicopters, has joined Pacific Industries, Inc, San Francisco, as president to replace **Donald D Smith** who has resigned. **Elbert M Gage,** formerly president of Teer, Wickwire & Co, Jackson, Mich, has also joined PII as assistant to the president.

Edgar C Rice has been appointed vice president of the Noble Co, Oakland, Calif. He will continue to serve as manager of the firm's automation division, currently producing automatic plate and sheet handling systems.

Alfred C Ekberg has been named district manager at the Detroit office of Pratt & Whitney Co to succeed **Samuel J Matchett** who has retired. Mr Ekberg has been sales engineer in the Indianapolis area.

67 of the... 100

...largest U.S. industrial corporations* are customers of ILLINOIS GEAR

In some fields this percentage is even higher. Of the major metal producing companies* 77% are customers of ILLINOIS GEAR.

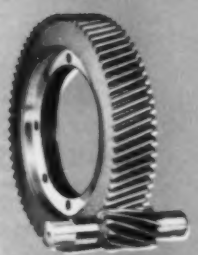
These are very remarkable percentages indeed . . . yet they reflect the preference for ILLINOIS GEARS by gear users, large and small, throughout industry.

And there's good reason: gear users turn to ILLINOIS GEAR because they are placing an ever-increasing emphasis on quality in gears . . . a quality that they demand and get in every order.

No matter what the industry . . . machine tools, steel mills, cement mills, paper mills, chemical plants, construction equipment . . . this recognition for quality in gears has been rightfully earned because it characterizes every step in the manufacture of ILLINOIS GEARS.

If you want gears that are made right, with quality as the first consideration, specify and buy ILLINOIS GEARS...they will more than satisfy your most exacting requirements.

*From The Fortune Directory of the 500 Largest U.S. Industrial Corporations, July 1957.



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Gears for Every Purpose ... one gear or 10,000 or more

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BRONZE BEARINGS
Wear Longer
or YOUR MONEY BACK!

So certain that the formula developed specifically for your bearings, bushings and wearing parts will be absolutely correct, American Crucible guarantees longer, trouble-free service or money refunded.

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Write for free literature and service data sheets or send prints and conditions of operation for recommendations and quotations. No obligation.

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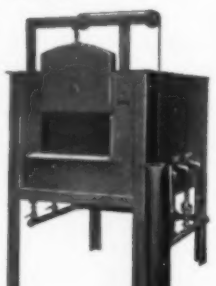
BURNERS & FURNACES (Heat Treating, Melting, Soldering)

NO BLOWER OR OTHER POWER NEEDED
. . . just connect to gas supply!

Outstanding service since 1911! Each unit, with the famous "BUZZER" Venturi, delivers the hottest, quickest heat attainable without a blower. Full range control of heat and turn-down. Standards or specials available for manufactured, natural or liquefied gas applications.



HIGH SPEED FULL MUFFLE FURNACES, Bench Type for heat treating high speed and alloy steels — temperatures to 2400° F.

LARGE FLOOR TYPE OVEN FURNACES for universal heat treating of larger pieces — temperatures to 2000° F.

WRITE FOR NEW "BUZZER" CATALOG

CHARLES A. HONES, INC.

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Round Table...

MANAGER OR SUPER MECHANIC?

Does a foreman have to know everything about the equipment in his department—to the extent of being able to repair breakdowns?—or should he concentrate on being a skilled administrator?

A good foreman must have a thorough knowledge of his firm's product, but it is no longer necessary, nor even is it considered important, that he be able to take any man's job and produce a better product in less time than the man himself. Today's production is mostly the output of specialists, each man doing a small operation at high speed. A large output of parts which must be within the tolerance limits is demanded and to expect any one man, foreman or not, to be able to out-perform a lot of trained specialists in accuracy and speed at each man's specialty is ridiculous. The foreman, however, must know if each man's work is up to the standards established for that output. It is true that some managers have said that even the knowledge of good workmanship is no longer needed by the foreman since the inspectors will promptly catch all sloppy work; but this is a dangerous assumption since inspectors are sometimes known to be too generous about tolerances with the inevitable result; a gradual falling off in repeat orders—the warning of a business entering a decline.

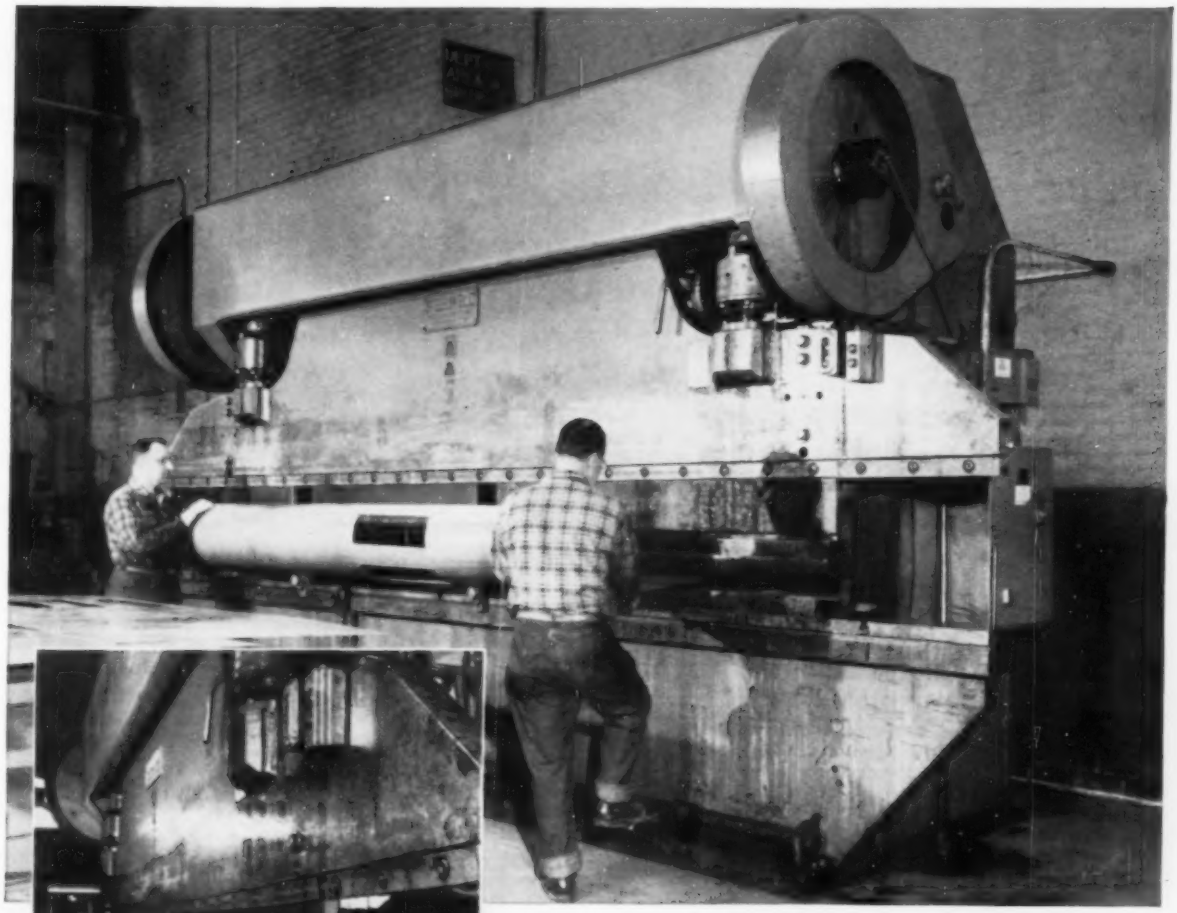
A good foreman possesses the ability to make his men proud of their work and feel that a great deal of the success of the firm is due to

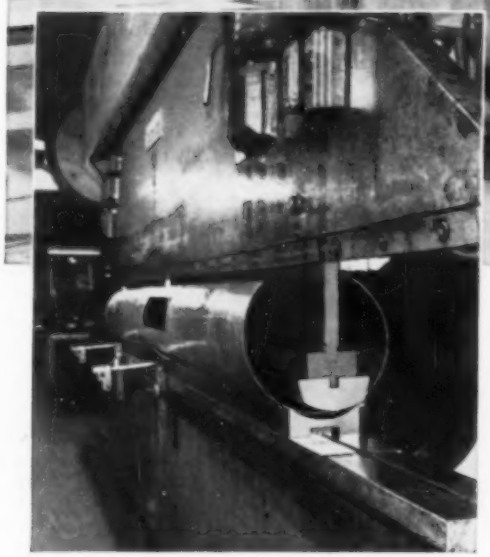
"It's only a little ink blob but it's the most original thing I've seen around here in weeks."

COMBINE AUGER TUBES

25 to 50 Made Per Hour at Massey-Harris-Ferguson, Ltd.

Steelweld Brake in service since 1950. Bed and ram are 18'-0" long including 2'-0" extensions at both ends. Bending capacity rated at 12' x 3/16".





Flat metal is quickly formed into a cylinder by a series of pressure contacts with this die arrangement.

AUGER tubes for combines made at Massey-Harris-Ferguson, Ltd., Toronto, are produced at rates of 25 to 50 per hour, depending upon conditions, with a Steelweld Brake. The tubes are from 10 to 16 feet long and made of 16 gauge steel.

This job represents one of a multitude performed at low cost on this brake, which is used for many bending and metal-forming operations required for the various farm implements built by Massey-Harris-Ferguson.

Steelwelds are popular with farm machinery manufacturers and have been serving many for years. They perform accurately, keep going continuously on long production runs without need of frequent adjustments, tinkering and maintenance. They are easy and safe to operate. Dies are quickly changed.

Because Steelweld Brakes are heavily built machines loaded with features that will help you, it will be to your interest to give them serious consideration when additional brakes are needed.

STEELWELD
PRESS BRAKES

Write for free copy of Catalog No. 2010
Gives construction and engineering details

STEELWELD DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 1468 E. 281 ST. • WICKLIFFE, OHIO

DO YOU NEED BETTER METAL CLEANERS FOR THESE JOBS?

All the tough jobs are covered by Oakite's booklet on *"Cleaning and preparing metal in aircraft production"*. Just check this list of contents for reminders of operations that give you trouble:

	SEE PAGES
☐ Cleaning aluminum (with or without etching)	2
☐ Preparing aluminum for welding	3
☐ ChromiCoating aluminum before painting	4
☐ Stripping paint from aluminum, steel	5, 9
☐ Barrel finishing aluminum, steel, copper	5, 9, 11
☐ Cleaning magnesium	6
☐ Cleaning steel; derusting and descaling	7
☐ Preventing rust	8
☐ One-operation preparation for painting	9
☐ CrysCoating steel before painting	10
☐ Cleaning copper and its alloys	11
☐ Controlling water in paint spray booths	12

FREE For your copy of this 16-page illustrated booklet, write Oakite Products, Inc., 24 Rector Street, New York 6, N. Y.

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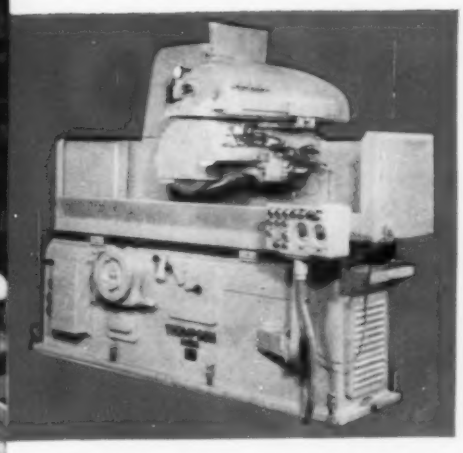
their excellent workmanship. At the same time he never forgets that he must keep costs down to a minimum, not by cheapening the product, but by eliminating waste motion, reducing spoiled work, using jigs and fixtures on sizable orders, and checking that proper cuts and feeds are being used on all machining operations. He must do this in such a way that the operator will realize that these days it is not enough to do good work, but it must be done fast, just the same as it is in sports.

A good foreman is friendly and helpful and the men are not afraid to ask his opinion on some new method they propose to use in setting up a job, or a change in operation sequence to cut time, for they know that sound advice will be forthcoming. When you find a department where the men are friendly to each other, take pride in their product, keep the place neat and tidy and maintain a steady output of high quality work, you can be sure to find a good and efficient foreman of the kind that are so very hard to discover.

Then there is the unskilled administrator who sometimes is put in charge of a mechanical department on the basis that it is quite unnecessary for him to be a mechanic since, it is claimed, the personnel manager hires only experienced mechanics who know their stuff and therefore don't need any mechanical supervision. Even if occasionally some sloppy work should be headed for the shipping department there are eagle-eyed inspectors, waiting and watching with their tolerance gages, who form a barrier and prevent these parts from reaching the shipping floor. That is all very

"I resent being told that I resent being told anything!"

THE NEW THOMPSON PLUNGE-MATIC SURFACE GRINDER



COMPLETELY AUTOMATIC

With the new Plunge-Matic, Thompson now offers a plunge feed machine for those surface grinding jobs where the area to be ground is constantly covered by the grinding wheel width. Designed for fast production, the Plunge-Matic is completely automatic—including downfeed, wheel dressing and automatic compensation.

Shown above is one of four Plunge-Matics in use at the Disston Division, H. K. Porter Company, Inc., grinding high quality hand saws. The saws are held on tapered flux bars or magnetic shims and the wheel face is dressed straight with an automatic power operated wheel truing device. The four machines are equipped with a pre-selected variable downfeed arrangement which automatically decreases the downfeed rate as the contact area of the work increases. The wheel heads are also equipped with oscillating crossfeeds. Being completely automatic in their cycles, the four machines require but two operators who load and unload only.

Constant Accuracy is Assured by Hydra-Cool

All Thompson Plunge-Matics are made in various types and sizes to meet all job requirements. All machines of 40 inches and up in work length are equipped with the Hydra-Cool Hydraulic System*—the exclusive Thompson feature which eliminates all heat distortion throughout the machine.

* PAT. APPLIED FOR

The new Thompson Plunge-Matics are designed to grind contoured as well as flat surfaces with equal efficiency. The three drawings at right represent but three of many contour jobs which Thompson Plunge-Matics are now handling successfully.

SPECIFICATIONS	
GRINDERS:	Thompson Type C 12"x16"x-48" Plunge-Matics
WHEELHEAD:	40 HP
WHEEL:	20"x8"x12"
STOCK REMOVAL:	Approx. .010" from each side
PRODUCTION RATE:	60 saws every 50 minutes from 2 machines with one operator

Send for descriptive folder on this new Plunge-Matic surface grinder.

Thompson SURFACE GRINDERS

THE THOMPSON GRINDER CO.

SPRINGFIELD, OHIO

"Keep Thompson in mind for that daily grind"

Large
or small
INDUSTRIAL
CUT
GEARS

- FURNISHED COMPLETE
- CUSTOM CUT FROM YOUR BLANKS
- HEAT-TREATED, CASE OR FLAME-HARDENED

SIMONDS GEAR produces a complete line of industrial cut gears in a full range of sizes from cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite. Also heat-treated, case or flame-hardened carbon or alloy steel. Or, you may have your own gear blanks custom cut to your order. Same quality . . . same prompt service. Send us your requirements for quotation.

ALSO stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.

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THE SIMONDS GEAR & MFG. CO.
LIBERTY at 25TH PITTSBURGH 22, PA.
Quality Gears for over 65 years

nice in theory, but in practice, it is unsafe and too risky to have the life of a business depending upon this kind of theory.

The above idea brings to mind the case of the office-trained man who was put in charge of the annealing department of a large malleable iron foundry. He saw the men filling large annealing pots with white iron castings intermixed with crushed cinders. The piecework rate was based on the actual weight of white iron castings packed in the pots. This involved weighing and listing the castings delivered to each packer. The new foreman checked the price paid for each filled pot and was elated when he discovered that all the pots held about the same weight and the payment per pot was nearly uniform. He saw where a great saving could be made and so he set a uniform piece rate price per pot and laid off the weighers and the clerk. Thought he was making a substantial reduction in the annealing cost.

A week later, when the new uniform price pots had gone through the annealing process and were cooled he saw the pots dumped and then, suddenly, he discovered one of the facts of life: It is much easier to shovel cinders into the pots than it is to pack castings in the same pots and if the usual amount of castings are put in the top ring no one can tell any difference. Since only the number of pots packed per man-day was put on the time record, no one knew what pot was packed by which man; then the most money would be paid to the one who filled the most pots. So all the pots were simply full of cinders except for the top ring and the production of annealed castings amounted to 20% of the usual output for the week. The costs of annealing had jumped 500%, the foreman lost his executive position and was given back his old job in the office for which he was thankful. The manager decided that a foreman just had to really know all the details of annealing to be successful.

The next foreman was selected from the annealing-room gang and he proved to be most satisfactory.

George P Pearce
Albuquerque, N M

"Congratulations, Foobly! You've got a perfect record of running no scrap whatever . . ."

REFERENCE CORNER

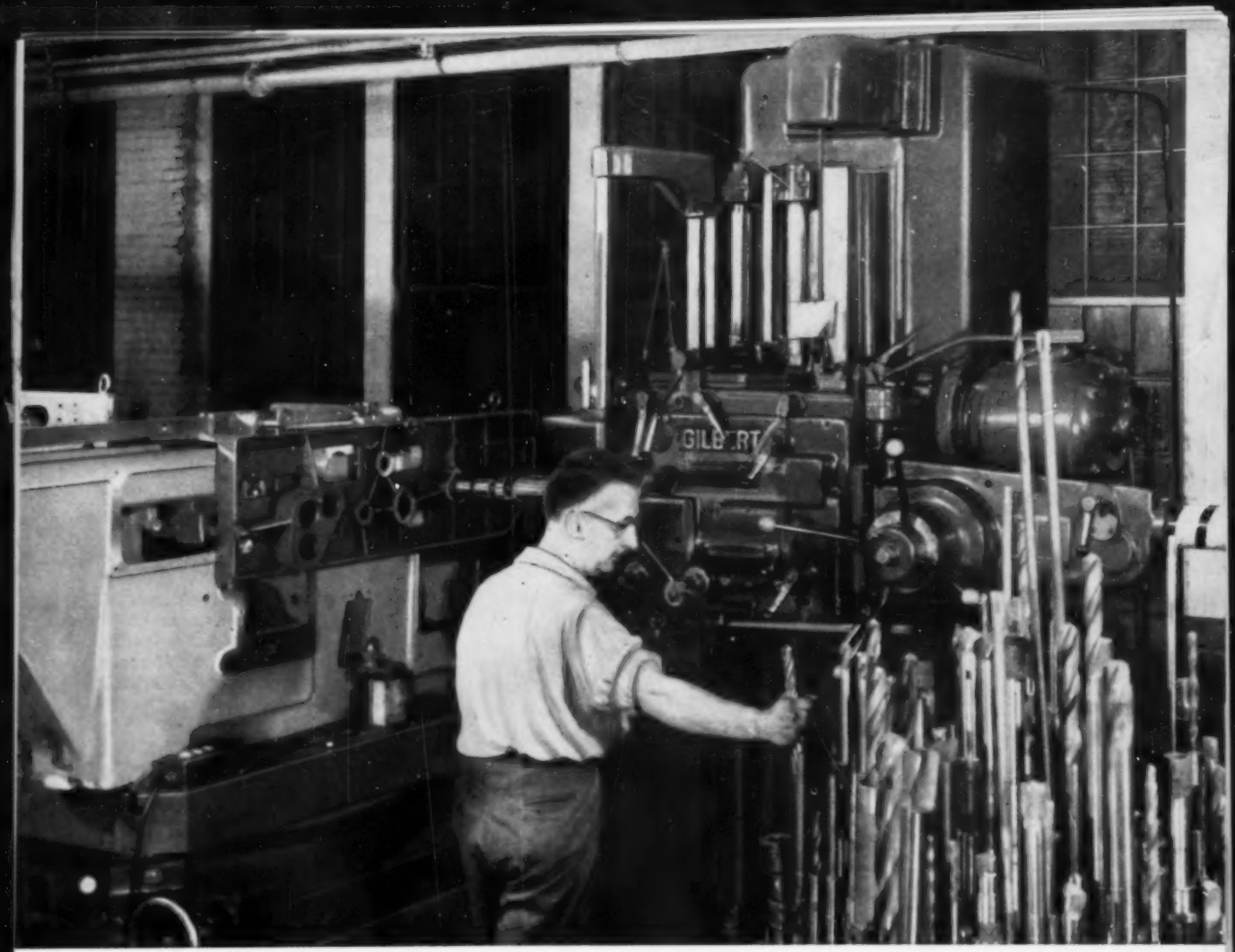
Would a small technical library be useful in the shop? Would it be abused, or simply not used? Can the men get sufficient information from their own or a foreman's handbooks?

WE HAVE rest rooms and smoking zones, we have coke machines and coffee breaks. However we still have a schedule to meet and a profit to make.

A reference room will provide one more reason for a man to be away from the machine or bench. It will provide another place for an unscheduled rest period. A man can find lots of interesting things to look at in a technical reference book, especially when he is doing it on company time. A reference library can prove to be an expensive form of subsidized education. There is a wealth of valuable and useful information in these books but management cannot afford the duplication of effort which will result if the shopmen start using this proposed library.

This is the job for the designers, the draftsman and occasionally the foreman. The working man should concentrate on keeping his machine producing. If he has a problem it is the foreman's job to provide the solution. The foreman is the one who should go after the answer, from the reference books or from the designers. When he finds the answer it can be put to good use for he can relay it to all the men in the department. The foreman should have a few reference books of his own and when necessary he can use the books in the design office.

If a reference library is set up for all to use there will be considerable overlapping of effort for a number of men may be seeking the answer to the same problem. If they do suc-



courtesy Brown & Sharpe Mfg. Co.

Brown & Sharpe cuts time 75% with Gilbert boring mill

"The handling time on this job has been reduced by 75% and the machining time has been reduced by 40%," says T. R. Buckles, Equipment Engineer for Brown & Sharpe Mfg. Co.

These profitable savings were earned by fitting a Cincinnati Gilbert boring mill with a Gilbert revolving table, adjustable on runway, and traveling tool holder designed by Brown & Sharpe.

There are about 180 holes in the workpiece. The boring mill performs drilling, reaming, tapping, or boring operations as well as some milling cuts. The job was formerly done on a radial drill, portable drill, and floor type miller.

This is another typical example of the time saved (and profits earned) by Cincinnati Gilbert horizontal boring mills. Our man will be glad to show you more examples.

The Cincinnati Gilbert Machine Tool Co.
3340 Beekman Street, Cincinnati 23, Ohio

those who buy Gilbert buy **GILBERT** *again*

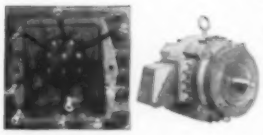
REEVES *Vari-Speed MOTODRIVE*

● Put a halt to high replacement costs in corrosive atmosphere with this complete variable speed power package . . . by REEVES.

Available from ¼ through 5 hp., the 100, 200 and 300 size Motodrives are resistant to most acids, gasses and corrosive dusts. They feature a wide speed range . . . up to 10:1 with gear ratios from 1.17:1 to 195:1 . . . and provide infinitely variable speeds in hundreds of standard assemblies to fit nearly any space requirement.

Corrosion-Proof Disc Assemblies
Corrosion resistant cast iron; Exclusive REEVES "close grooving"—for positive disc lubrication.

Corrosion-Proof Gear Reducers
Cast iron gearbox and head; shaft oil seal—double lip neoprene; leak proof vent plug.



Corrosion-Proof Motor
Solid cast iron housing and fan—fully sealed cast iron conduit box—motor lead gasket seals off motor windings.

Fully sealed cast iron Motodrive case and inspection plates protect operating internals—lifetime stainless steel nameplates and identification plates—zinc plated Hexhead capscrews throughout. Write for Bulletin A34-M578.

REEVES PULLEY COMPANY
Division of **RELIANCE** ELECTRIC AND ENGINEERING CO.
Columbus, Indiana

ceed in finding it they are not in a position to disseminate the information to the other men in the department who may be able to use it.

Permitting the men the liberty of seeking the answer to these problems is unwise for it will weaken the position of the foreman. What if the man comes up with the wrong answer and spoils a job? What can be done about the antagonistic employee who uses the library to dispute the foreman's methods?

It isn't just anybody who can correctly understand and interpret the information in the handbook. It takes some background and experience at using these books to permit one to use them effectively and locate the answer quickly. A man who is not familiar with the books can spend a great deal of time looking up an item and studying the details.

It is difficult enough to maintain discipline and respect for authority in the shop. Setting up a reference library will only create additional problems. Keep the reference books where they belong, on the foreman's desk or in the office. If a shopman has enthusiasm and a real desire to learn he can pick up a few reference books for his own private use.

Ernest Jones
Bronx, NY

IF A HOUSE without books is like a house without windows then a machine shop without reference material is like a loaf of stale bread.

While he's on the job it is not uncommon for a worker to discover a better way of performing an operation. However, he may be ignorant of the limitations of the implements that he wishes to employ in making the change. If he can thumb through a readily available book to find his

"Sorry, . . . this coffee's getting cold . . ."

ARROW PROFILER SWARF

mills from -20° to +20° in steel!

The Arrow Profiler with swarf attachment machines swarf or twist cuts 20° either side of vertical —simultaneous with two or three-dimensional contouring. You can mill *steel*, as well as aluminum, magnesium and titanium, with swarf angle tolerance held to ± *1 minute*.

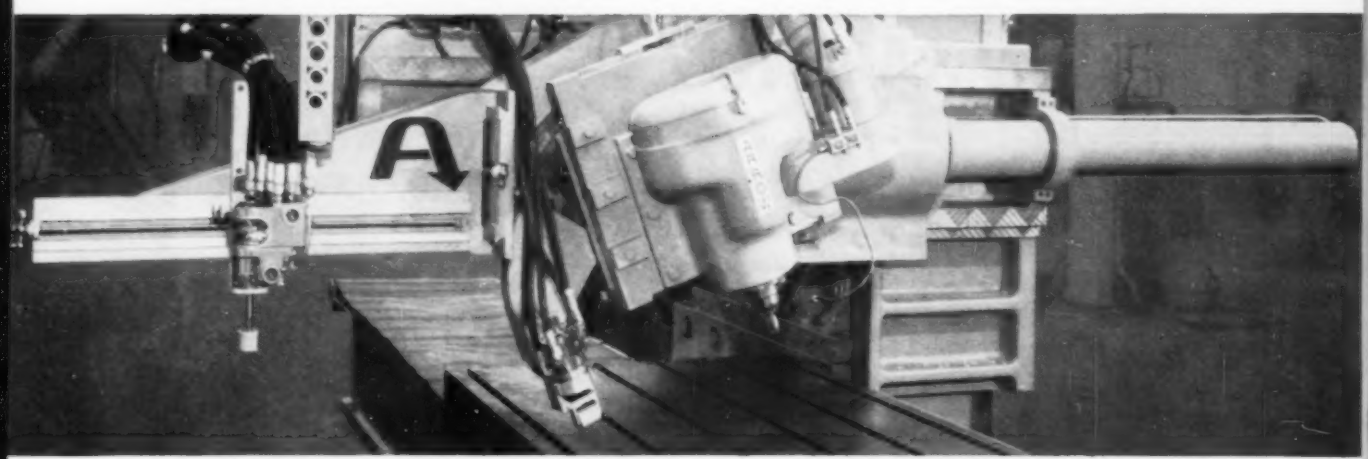
A separate 180° valve operating on its own rise and fall template actuates the swarf. This valve is mounted directly on the swarf head; no accuracy-stealing linkage to "give" or wear out. Contour is controlled by the regular tracing valve, with stylus manually operated against the two or three-dimensional template.

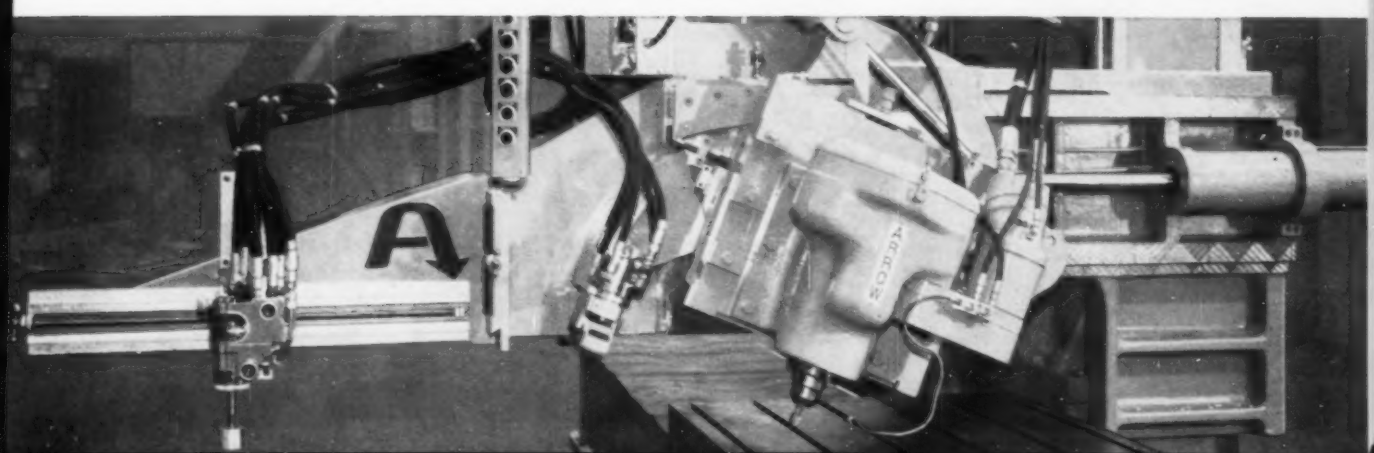
The Arrow Profiler, with its 40 hp hydraulic spindle, cuts steel up to limits of cutters. 25 speeds from 37 to 3000 rpm. Table is 42″ x 144″, with 136″ travel. It is easy to operate, accurate and versatile. And it costs less than any comparable machine.

There's a reason for Arrow's low cost—simplicity. No frills. Just the basic machine you need, without little-used gadgets and accessories. Plus a simple *manual* concept of operation.

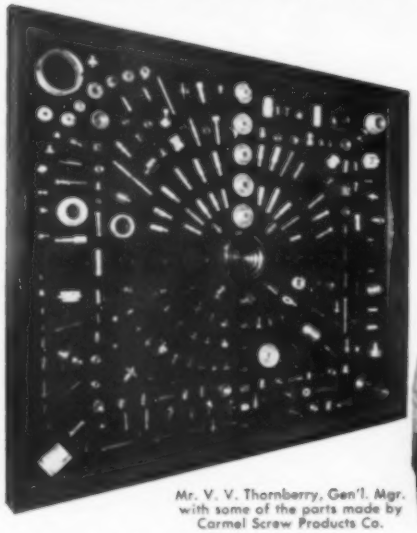
Write today for Bulletin PR-156A for a complete description of the Arrow Profiler and Swarf Attachment.

ARROW ENGINEERING COMPANY, INC. *1523 Oliver Avenue, Indianapolis 21, Indiana*





Critical aircraft tolerances "duck soup" with



Mr. V. V. Thornberry, Gen'l. Mgr. with some of the parts made by Carmel Screw Products Co.

Buck® AJUST-TRU POWER CHUCKS

★

INDIANA FIRM BUILDS PRECISION REPUTATION SPECIALIZING ON AIRCRAFT PARTS

★

65% of these parts are made with the 7 Buck Power chucks used by the Carmel (Ind.) Screw Products Co.

Typical performance reports include: "We thread class 4 tolerances with face run-out held within .001" (and less) indicator reading of pitch line of thread" . . . "Tolerances are held to better than Buck guarantee of .001" precision in relation to bore and face with no difficulty."

The Buck Jaw Turning Fixture is used in the tool room to save tieing up production machines.

More and more firms every day learn that *"It pays to chuck with Buck."* Send for catalog—see why.

BUCK TOOL COMPANY

310 SCHIPPERS LANE • KALAMAZOO, MICH.

FRICTION SAWING

with

Tannewitz HIGH SPEED BAND SAWS

IS EXCEEDINGLY FAST, SMOOTH, INVOLVES SO LITTLE DOWN-DRAG THAT FORMED PARTS CAN READILY BE CUT WITHOUT ANY REST

Tremendous time and cost savings, in cutting sheet steel, formed or flat, trimming malleable and steel castings and similar operations, are available to you with these machines.
Get the facts. Ask for FREE copy of "FRICTION SAWING."

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TANNEWITZ DIE-SAWS
24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Die Saws on the market. Write for bulletin.

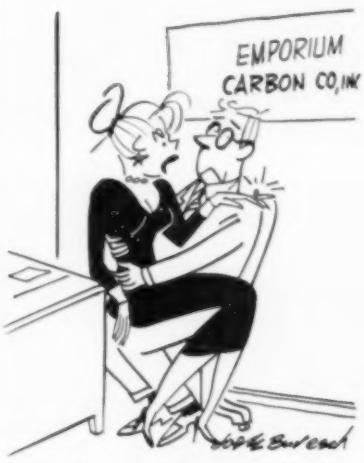
SAWING MACHINERY SPECIALISTS

answer he will not hesitate to do so. If the alternative means a visit to the Public Library on his own time to get the information, dollars to doughnuts the potential improvement will fall by the wayside.

Technical reading material frequently has a wealth of new ideas for the casual onlooker. Unfortunately it doesn't get into proper channels as often as it should. Job applicants in the teaching profession are judged by the current periodicals to which they subscribe. Why shouldn't shop workers be encouraged to take an interest in their trade publications? If books were as rare as they were in the eleventh century, when they were all hand-written, everyone would grasp at the opportunity to devour them. Today literally thousands of volumes have been untouched by human hands for years. Nevertheless they are still valuable even though their worth is often underestimated.

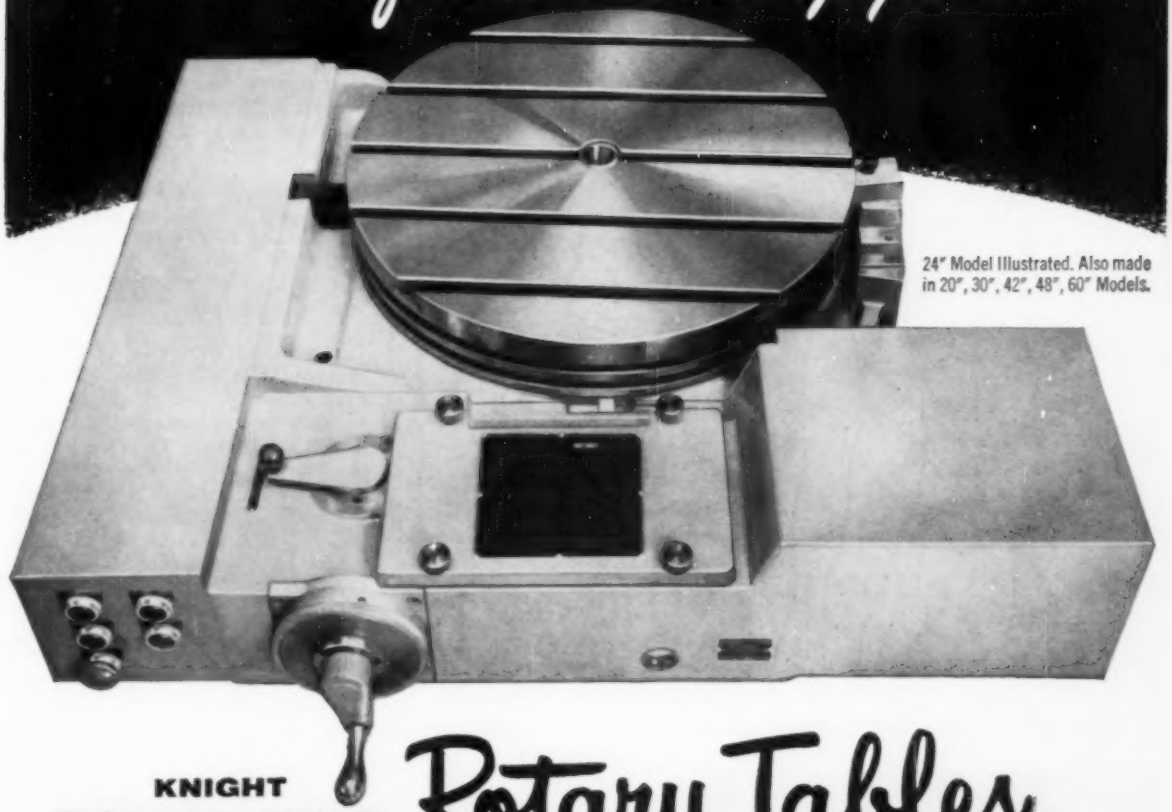
If a man is interested enough in his job to refer to a company library then the company should be more than pleased to encourage the development of any interest that is to its own advantage. The example of those who use such a convenience will encourage others to broaden their scope and enhance the quality of their worth by seeking to pool their ideas with authorities in the field.

There is an additional reason for such a service. In every library there is a record kept of the names of the borrowers. This might prove especially helpful to the personnel department when it comes time for making decisions about promotions. The well rounded student is the one



"I trust this is a genuine diamond and not one of your company's by-products!"

INCREASE THE OUTPUT of Your Present Equipment!



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KNIGHT POWER FEED Rotary Tables

MACHINE DESIGNERS

Extreme versatility and unusual features of Knight Tables make them ideal as an integral part of specialized milling, drilling, boring machines. Knight engineers will be glad to help. Write!

These completely self-contained motor-driven units make it easy to adapt your milling, boring or drilling machines for economical, accurate circular milling—face milling—cycle milling—indexing—automatic positioning—an endless range of other special jobs.

Setup time is practically eliminated. No connecting drive to machine is required. Easily moved from one machine to another. Just plug into electric outlet for immediate operation.

Tables 24" to 60" have Feed, Rapid Traverse and Rapid Return in either direction, Stop and Automatic Positioning. Available separate electrics allow operation in both horizontal and vertical positions.

Mail coupon for complete details.

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Send new brochure on Power Feed Rotary Tables.

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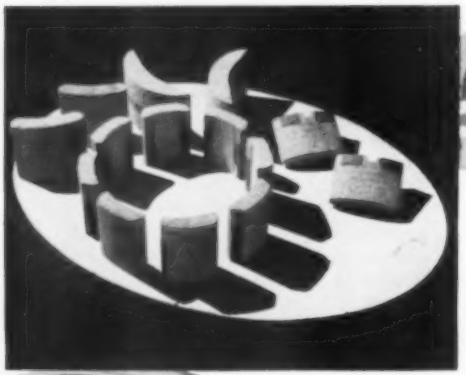
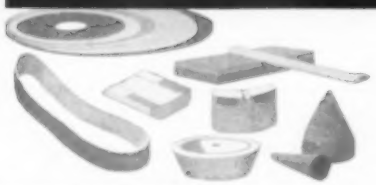
☐ Also send details on Knight Milling Machines.

There is a difference



Regardless of your abrasive needs—coated abrasives, grinding wheels, honing stones, abrasive grain—Mid-West, with its modern facilities, vigorous research and development and trained abrasive engineers is your one sure source for complete satisfaction.



and progressive thinking makes the difference

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who participates in extra-curricular activities. The better citizens partake of community projects. The best workers are the ones who have more than a passing interest in their jobs.

Neal A Mack
Belle Harbor, NY

OPEN FORUM

If a factory representative is following up performance of new equipment in the shop, should he discuss it with the front office, or will he get a better picture from the actual operator of the machine?

THE PRIMARY OBJECTIVE of a good engineer is to build a machine that runs smoothly and efficiently with as much ease in operating as is technically practicable. To place a knob for the sole convenience of the operator might result in a mechanical labyrinth. Nevertheless, it is quite possible to inadvertently so place a knob as to invite occupational hazard, however minor. This could be Swanson's situation to whose lot it has fallen to take the rap—on his knuckles.

After a reasonable break-in period, if Swanson still has trouble in spite of his best efforts in accordance with instructions issued by the manufacturer, he is not just "blowing off steam" for a minor irritation. It may be that he is to blame and that he lacks the ability to adjust to a new design. On the other hand, a test of operating skill by other workers might prove that Swanson is right, that it is impossible to reach for the rear slide tool con-

"I don't know about the progress on my job but I'm sure making good time with that blond on #3 conveyor."

trol without skinning the knuckles, and that therefore the machine is faulty and of poor design.

A machine that permits repeated injury certainly warrants investigation. To pass Swanson's complaint along the devious route to the front office with attempts to solve it at the top level may only result in delay and needless concern by those not directly involved.

If all manufacturers do not make follow-up inspections of newly installed machines it is safe to assume that a reputable company realizes the value of customer satisfaction and is bound by its good-will policy to send a technical representative if requested. By the very nature of his profession this engineer would welcome a talk with the operator having the difficulty as the first step in getting to the seat of the trouble. Valuable time would thus be saved and the details of the situation clearly transmitted.

To avoid the issue with a "wait-and-see" attitude can only result in lowered morale, a resentful and discontented worker. The facts clearly indicate that the manufacturer should be given a chance to either justify the placement of the knob or correct a faulty design. Furthermore, bruises will heal quickly if confidence in a competent worker is shown by permitting him to personally present his views on the subject.

E S Mulligan
Westbury, NY

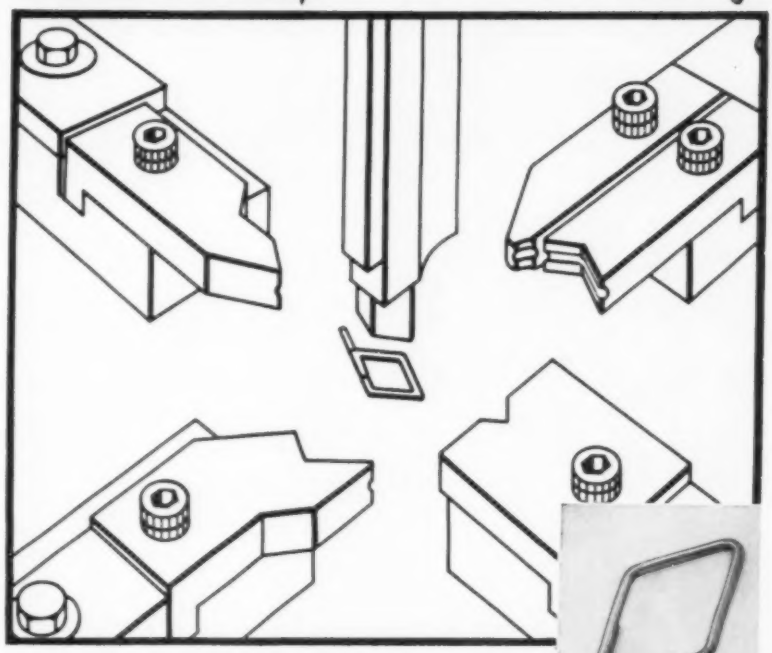
BEAT—ON HIS OWN TIME

Has the company any say in whether a worker takes on a part-time job at night? If his daytime performance is satisfactory, can there be any legitimate complaint?

SHOP LIFE and home life complement each other to such an extent that it is difficult to think of them as independent entities. The working hours are spent in the shop to provide funds to support the home life. In turn, the home provides rest and shelter between each work period.

When a man enters the plant and punches the clock he does not sever all ties with the home life; rather it is the home life that provides the incentive to do a good job. When he departs at the end of the working day he is not separating himself completely from the responsibilities of his work. He is going home because

NILSON 4-SLIDES FORMING PRODUCTION PROFITS... *Automatically*



16,000 PARTS PER HOUR on a NILSON *Automatic* 4-SLIDE

PRODUCT: Deadlock Hook
MATERIAL: Soft Basic Wire
PRODUCTION: 280 Pieces Per Minute
MACHINE: No. S-0 Nilson 4-Slide

SIZE RANGES:
Wire up to ½" diameter
Ribbon stock to 3½" wide
Feeds up to 32"

5 TO 75 TON PRESS SECTIONS

Whether your product is formed simply . . . or requires complex bending in several planes . . . a Nilson 4-Slide may be the solution to your production problems.

The sketch above shows the tooling used by a leading manufacturer to mass-produce metal hooks—at the rate of 280 pieces per minute! A Nilson 4-Slide has proved to be the most efficient, economical way to manufacture this product . . . and many other kinds of wire forms and small metal stampings.

Manufacturing costs must be kept down to meet today's competition. The combination of high speed and product uniformity—basic advantages of Nilson 4-Slides—means maximum production, minimum operating costs.

Before you design, tool, or specify manufacturing methods for your product, get in touch with Nilson. Over 60 years of experience with wire and metal forming applications can help you form better products . . . more profitably.

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THE A. H. NILSON MACHINE CO.
1501 Bridgeport Avenue • Shelton, Conn.
AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT

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TO FIT EVERY
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Inside, outside, flange mounted, immersed type, pipe connected, and tank units . . . you name it . . . we have it. Choose the make and model GUSHER PUMP that best fits your application.
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1819 Reading Road, Cincinnati, Ohio

his day's work is complete but this off-time also provides rest and relaxation for the next day's work.

In his decisions regarding the home life he may or may not be cognizant of his responsibilities to the shop. He should be constantly aware that it is the shop that makes the home life possible. A man may make an error in judgment and fail to give sufficient recognition to this responsibility. If he frequently comes to work tired, no matter what the cause, he is disturbing the balance of the relationship.

In such a case the employer or his representative has every right to speak to the employee and request a correction of the situation. Such a word of caution is for their mutual benefit. Without it the imbalance might become progressively worse and result in discharge of the employee.

Ernest Jones
Bronx, NY

HOLD BACK THE PAY

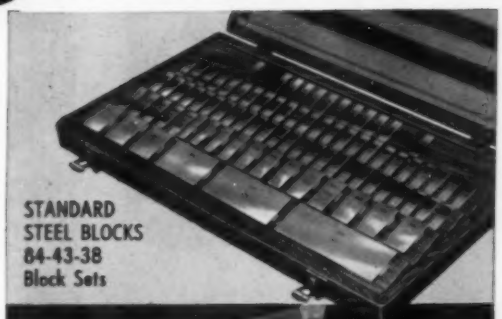
Can a company legitimately hold back a man's first week's pay as a form of security for both parties? Even if it is restored when a man leaves, will it cause resentment and misunderstanding among the workers?

ED SEEMS BENT on turning back the clock when he advocates holding up a week's pay from the men till they are making a voluntary move or are being laid off. In England, and, I believe, in Britain generally, held-back pay is known as "lying time" and in many companies the iniquity is still prevalent. I know nothing about the legality of the transaction but agree with Al that it leaves a nasty taste in the mouth. So long

Webber Gage Blocks

Insure the Accuracy Essential To Mass Precision Production

Making Webber Gage Blocks is a science—a combination of human skill and the world's finest mechanical and laboratory equipment, both highly specialized. Only with such a combination can gage blocks be made to meet the high standards which Webber steadfastly maintains. Webber can fill your every gage block need, with the most complete line of gage blocks and related accessories.



STANDARD STEEL BLOCKS 84-43-38 Block Sets

"THIN BLOCK" Gage Set 30 Blocks

SQUARE Gage Blocks
In Standard Steel and CROBLOX (solid chrome carbide)

In 88, 85, 84, 81, 36, and 34 Block Sets
Accuracies, both steel and Croblox, "B" +.000006 "A" +.000004
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Illustrated — Set No. 88A with Accessories

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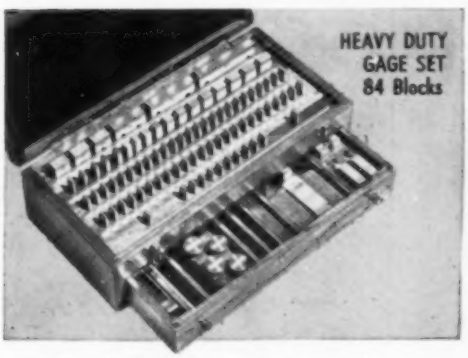
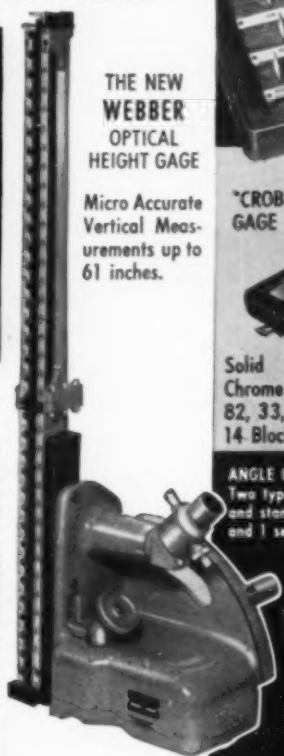
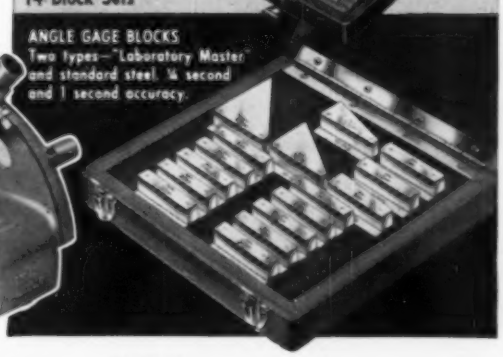


HEAVY DUTY GAGE SET 84 Blocks

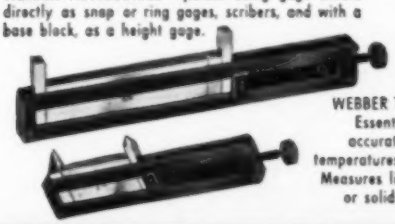


THE NEW WEBBER OPTICAL HEIGHT GAGE
Micro Accurate Vertical Measurements up to 61 inches.



ANGLE GAGE BLOCKS
Two types—"Laboratory Master" and standard steel. ¼ second and 1 second accuracy.

WEBBER ACCESSORIES—permit using gage blocks directly as snap or ring gages, scribers, and with a base block, as a height gage.



WEBBER TEMP-CHECK Essential wherever accurate control of temperatures is a must. Measures liquids, gases or solids. 4 Models.

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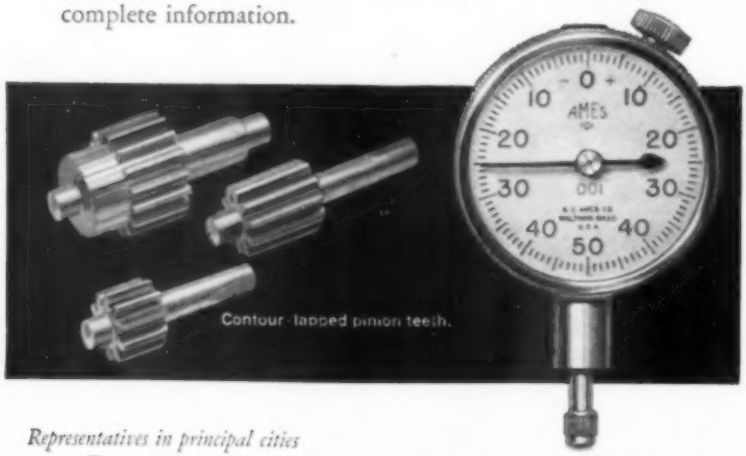
AMES

...the preferred Dial Indicators...

have contour-lapped pinion teeth for greater accuracy

Because tooth form determines how well pinions mesh—Ames hardens, contour laps, and carefully inspects pinions for perfect tooth form and finish. The result: Pinions that mesh perfectly, and a complete absence of accuracy-destroying "play". This extra attention to detail is typical of the Ames manufacturing approach. It helps explain why the lifetime cost of Ames Dial Indicators is lower, and why so many companies specify Ames as "preferred". Write today for complete information.



Representatives in principal cities

B.C. AMES CO.

26 Ames Street, Waltham 54, Mass.

MANUFACTURERS OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

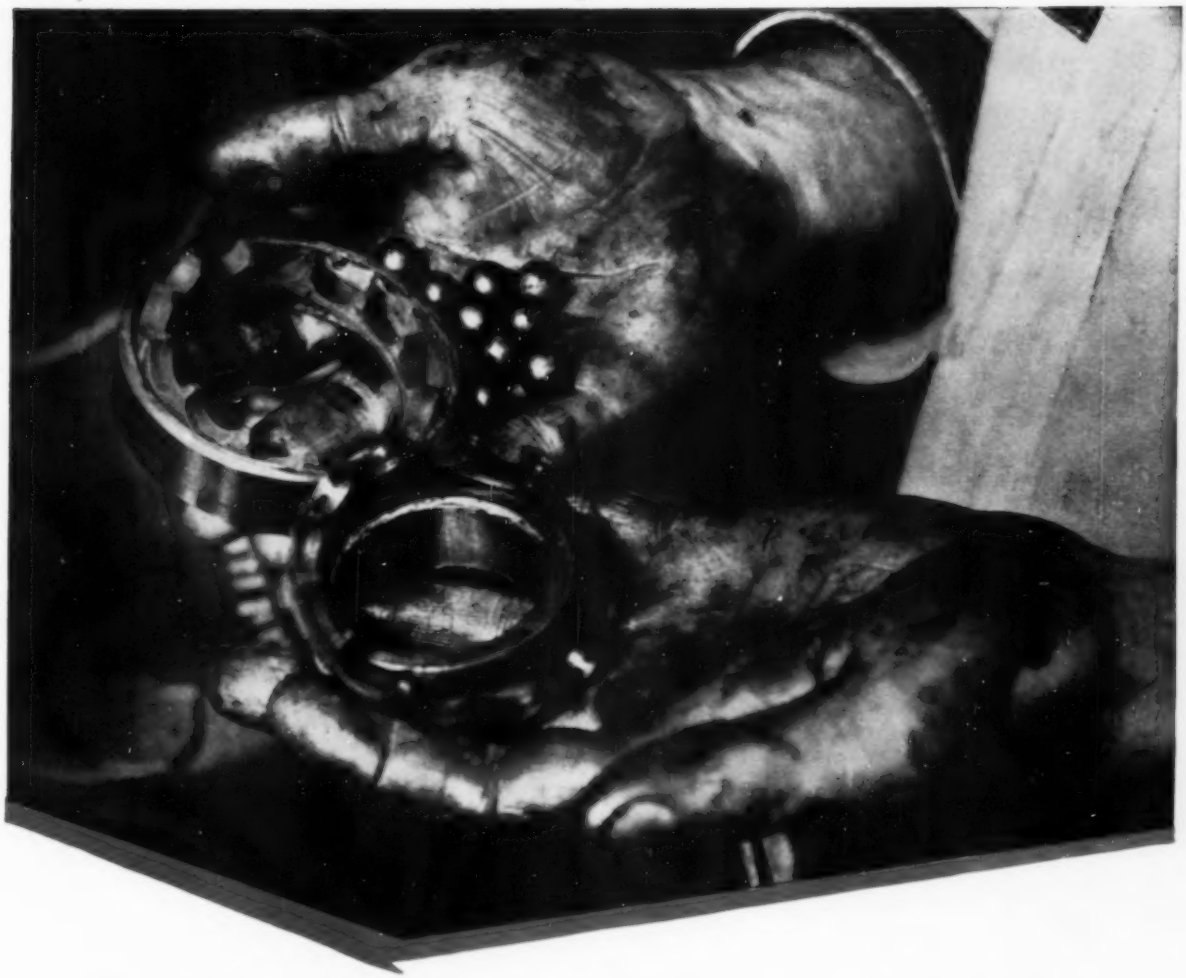
as a week's notice of leaving is in being, some method of enforcing the rule is desirable but some less penal method could surely be devised. For some time, progressive companies here have recognized, in a similar connection, the handicap attached to holidays *without* pay. That bogey has now largely disappeared and the time would seem ripe for a re-consideration of "hold-back pay."

It is highly inconvenient for the wives of married men with, perhaps, a young, growing family and probably working on a very narrow margin, to go without for a week. To be without a pay packet for a week is no joke, to know that the money has been earned but is withheld, is like rubbing salt into an open wound. If the enforcement of "hold back pay" cannot be entirely abolished, the end it is designed to serve could be achieved by deducting the amount in weekly instalments. That would not bear so heavily on the housewife who, in so many cases, must make the wage go as far as possible.

There is another angle to this subject which Ed and Al seem to have overlooked. Ed says it's like forcing men to bank a week's pay. In a way he is right, with this important difference. When a man banks a week's pay, the bank pays him a rate of interest for the use of his money.

Take the oldtimers who may be with one firm for about thirty years. Three per cent at compound interest for twenty or thirty years would show quite a nice profit which, in present circumstances, the boss reaps at the expense of the men. Multiplied by a hundred or two pays, the employer does not do so badly. I believe the "hold-back pay" should be deducted in smallish weekly instalments, and when the men leave the company employment it should be refunded plus a standard rate of interest, compounded. I believe that

"Just listen to this baby purr!"



When bearings must be replaced ..."almost the same" is always wrong!

There is a difference in precision, fit-up and clearance of bearings carrying the same part number and Bearings, Inc. experts know which bearing will give you longer service life on any application.

This knowledge, plus the immediate availability of all types of bearings used by industry, guarantees that you get the bearing best for each application! They will be "factory fresh"... incorporating the latest design and manufacturing advancements.

If in doubt about the proper specifications for a bearing application, contact the Bearings, Inc. engineer in your area — he'll be glad to make recommendations that are right all the way.

Always Buy from an Authorized Distributor.

Providing bearing service in the North ➤ **BEARINGS, INC.**

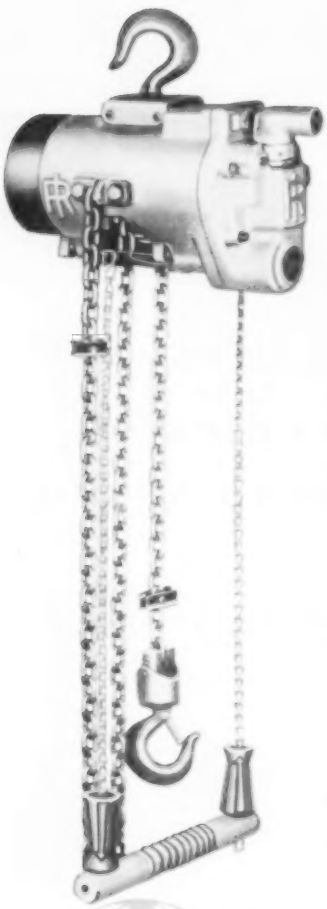
OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden
NEW YORK: Buffalo, Bolanrol Corp. • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and

in the South ➤ **DIXIE BEARINGS, INC.**

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
N. CAROLINA: Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville

new
LIGHT weight
LOW-HEAD
AIR HOISTS

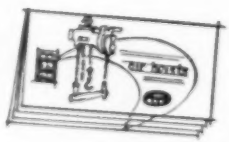


Unequalled for tough jobs, these hoists are unaffected by hot, corrosive, or wet atmospheres and are explosion and shock proof.

They are available in two capacities. The ½-ton size weighs only 39 lbs., and the 1-ton size weighs only 55 lbs. Fully-loaded lifting speeds are 40 fpm and 20 fpm respectively, and both units are available with either link or roller chain.

Ask your Ingersoll-Rand AIR-engineer to demonstrate these new "light weight leaders" in the complete line of Ingersoll-Rand air hoists from 200 lbs. to 24,000 lbs. capacity. Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Send for free copy of new Lightweight Air Hoist Bulletin Form 5224.



Ingersoll-Rand

Tools plus AIRengineering increase output per man

8-752

method would be more popular; it would clear the employer of any suspicion of "needling" the men and, taken in smallish instalments, it would not harass the housewife. It could be argued, quite truthfully, that employees wishing to decamp without notice in the early weeks of their employment would not be deterred by the temporary loss of a few small instalments of deferred pay.

No plan is likely to be foolproof. The company is the better for the loss, the quick quitters have no interest in that particular plant nor in the job they took on. Many of them are interested in no plant or job, for that matter, and merely exploit the blessing of full employment in order to gratify their frivolous desire for perpetual change, and to Jerico with the company; let it sink or swim. If that is a true assessment, and from experience I think it is, the company is well rid of them. A slick personnel department is the best protection against the fly-by-night fraternity. If "previous record" ranks high on their list of attractions leading to engagement, the frequent movers are likely to draw a blank.

I am not impressed with Ed's contention that holding back the first week's pay is a good way to make sure a man doesn't run off owing money advanced by the company to purchase tools. I think it's a rank bad way. Most companies provide all the really expensive tools required to execute their work. Any newcomer requiring a loan for inexpensive tools should be an object of suspicion to Personnel, the red light in fact. I agree with Al. In effect, it's a dirty trick, but I don't think it's intentionally dirty, merely

(Continued on page 222)

"Shine, Mister?"

How to do the Toughest 400 Ton Heavy Material Blanking Jobs *economically*

Use a press properly designed to exert the tremendous forces required.

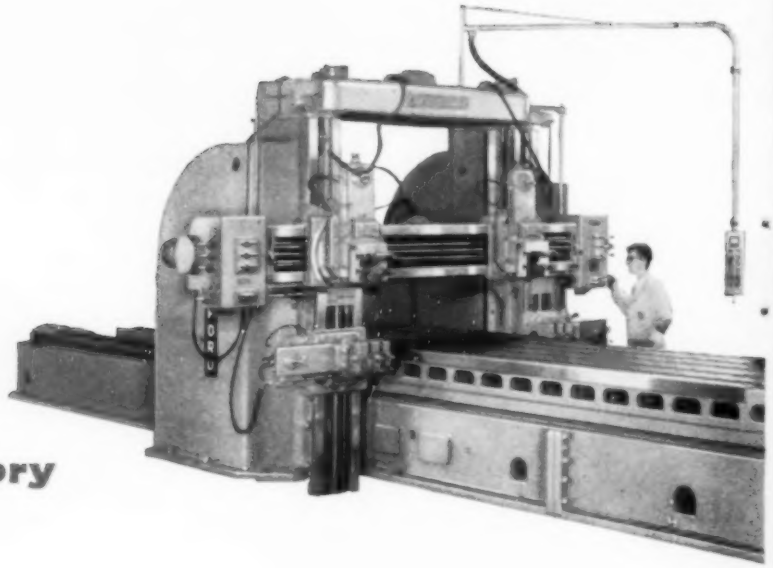
Use a press with the rigidity and mass to withstand the terrific shock of impact and sudden release of "snap-through" force encountered when blanking, punching or shearing heavy material.

Use a press that will give you high production with longer die life.

Use *the* heavy duty blanker . . . MINSTER 40E-9

The construction features that put the Minster 40E-9 press in a class by itself for this type of work are described and illustrated in a new Bulletin No. 12. May we send you a copy?

THE MINSTER MACHINE COMPANY • MINSTER, OHIO

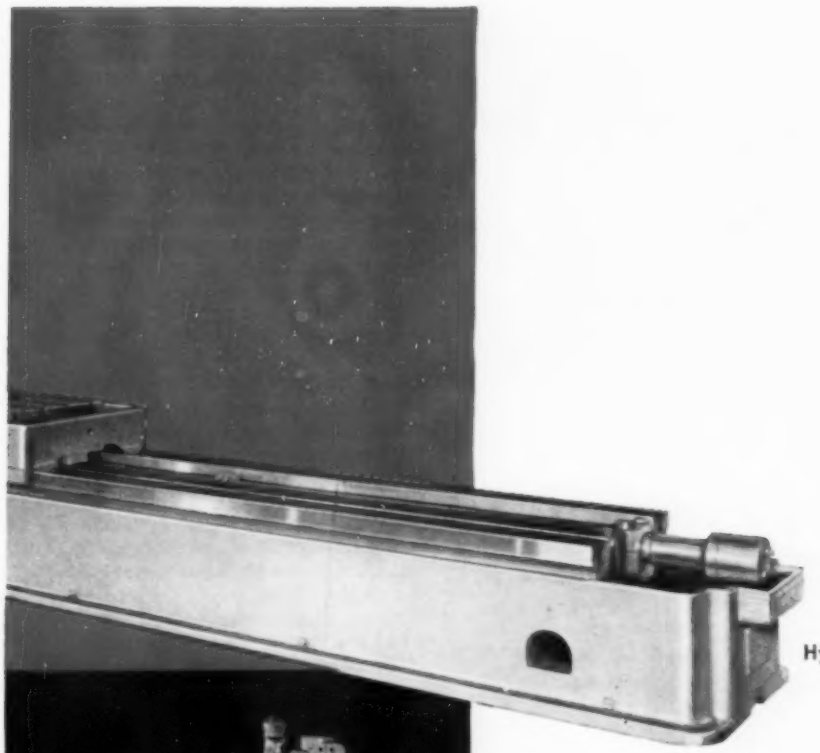


the hy-draulic story

"speeds for carbides plus heavy cut efficiency"

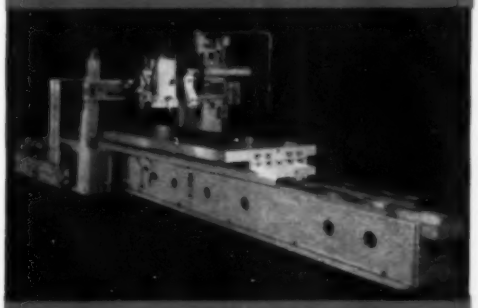
"push-button control speeds operation and set-up"

"hy-draulic triple circuit provides 3 distinct drives in a single machine"

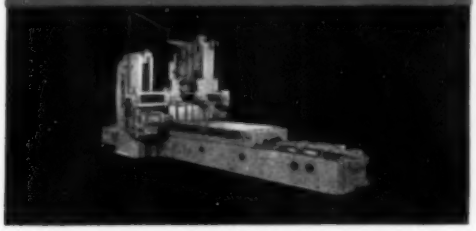


Hy-Draulic Double Housing Planer

20' Hy-Draulic Planer Grinder



Hy-Draulic Spar Planer with Twin Kopy-Kats



Hy-Draulic Openside Planer
with Outboard Support

...only with hy-draulic design do you get these advantages!

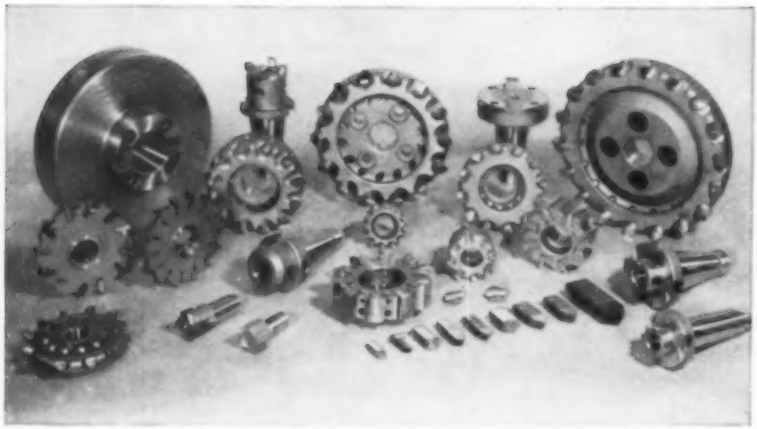
Hy-draulic drive and feeds, as basic features of Hy-Draulic Machine Tools, provide outstanding performance measured in terms of work quality, high production and low operating cost.

Today, countless metal-cutting operations are performed effortlessly, at low cost, and with high production rates on Rockford Hy-Draulic designed machines. Hy-draulic control and power respond instantly so that inexperienced operators easily adapt infinite speeds and feeds to the most complex and accurate machining cuts.

Compare your present shaping, planing or slotting operations with these modern production features, and determine the savings available with Hy-Draulic flexibility. Our engineers will be glad to furnish estimates for your particular requirements.

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

HYDRAULIC



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW

Lovejoy announces the "SHEARJOY", a completely new line of inserted-tooth face mills whose shearing action removes metal at record rates. H.S.S., and Vasco Supreme blades are available.

"Operator reports . . . best milling cutter he ever used on steel." "Prospect buys *Shearjoy* on the spot, after demonstration." "Customer reports 4½" feed at 52 RPM on tough die steel." "Used for 3 shifts without resharpening and without coolant."

Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

an outdated, clumsy arrangement to insure a week's notice of leaving. The concept is sound but its application seems harsh in the light of modern thought.

Something less heavy-handed should be devised. A lighter touch would not render the principle any less effective. It should not be forgotten that the unions are equally anxious that their members be given at least a week's notice of dismissal and it has become fashionable to demand a lump sum by way of compensation for those members whose services are no longer required. Fair enough, perhaps, but the giving must not always be from the one side. When unions make high demands on employers, they must be prepared to see that their members reciprocate. I wonder what would be the union's re-action to a notice of leaving amounting to three or four weeks and a lump sum per head, payable to the employers for loss of the services of those of their members who decided to move to other employment. Unions have been known to ask that members be given notice of a month or two when their members are about to be declared redundant, and, in addition, compensation for loss of employment, even when hundreds of unfilled vacancies exist in their area.

J C Ball
Stranraer, Scotland

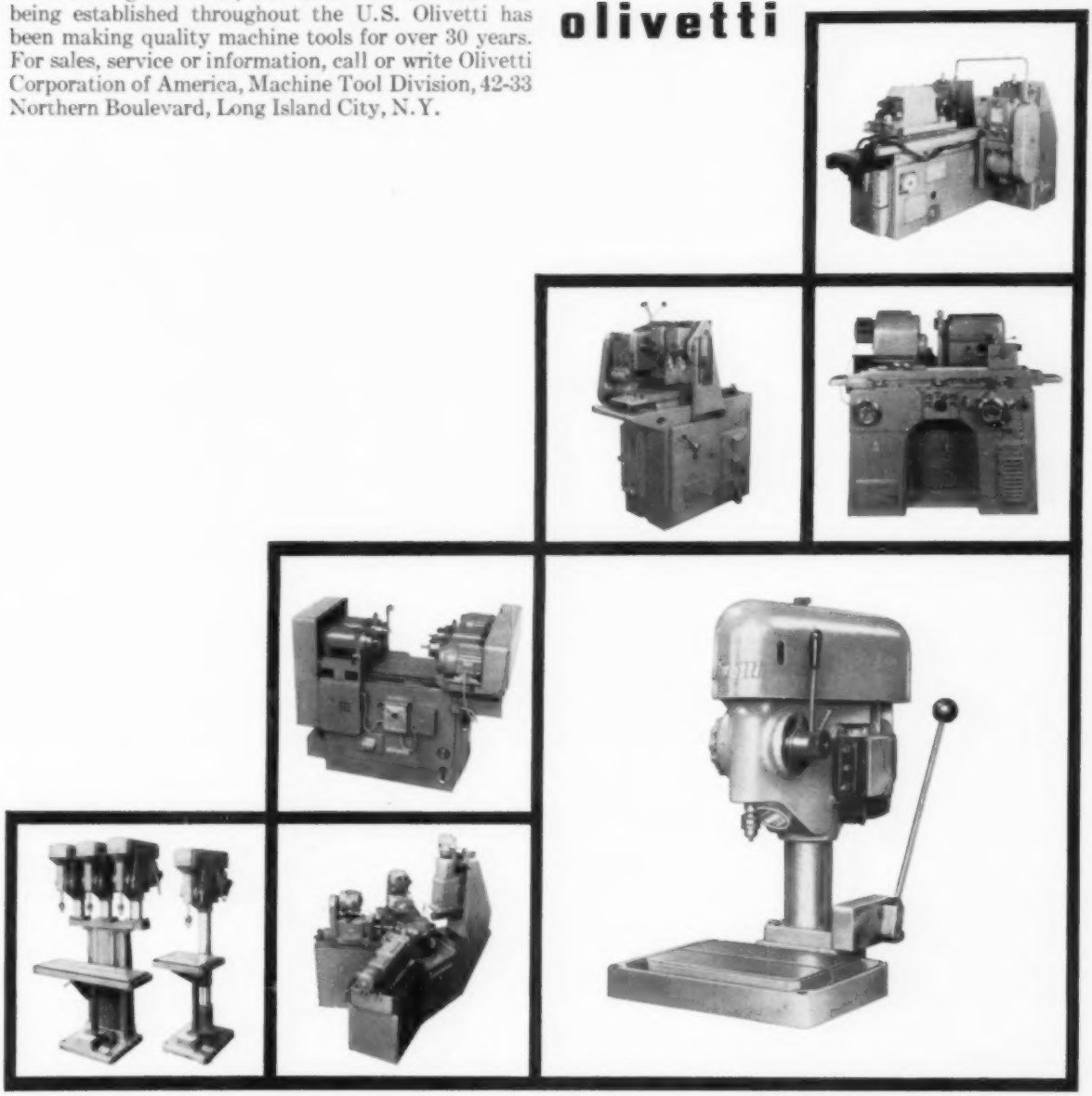
Is IT a hold-back or a hold-up when a company keeps a week's pay from an employee? You can call it what you like but if an individual or an organization takes possession of another's finances or property and no debt preceded the occurrence, the employee has every right to ask for an immediate return of his assets.

Why should a new worker have to have a week's salary postponed in-

"For the last time, Johnson, quit cutting up that bar of silver for juke box slugs . . ."

National distribution of Olivetti sensitive drill presses, cylindrical grinders, production milling machines, automatic boring machines, and units for automation is being established throughout the U.S. Olivetti has been making quality machine tools for over 30 years. For sales, service or information, call or write Olivetti Corporation of America, Machine Tool Division, 42-33 Northern Boulevard, Long Island City, N.Y.

olivetti



SOME FEATURES OF OLIVETTI DRILL PRESSES

Hydraulic head or table raising/ precision spindle/ flat belt drive for minimum vibration/ solidly built (T6-b weighs 176 lbs.)/ extra-sensitive adjustable spring return feed lever/ work light (extra) built into head/ powerful (T6 has a $\frac{3}{4}$ H.P. motor).

Model T6-b (shown above) has 7/32" capacity, 8 speeds up to 12,000 r.p.m. Other models: T12, 15/32" capacity; T18, 11/16" capacity.

WHY MACHINE IT?

Use FLOTRUSION®, a new and revolutionary method of cold flowing various metals into tubular forms of all shapes and sizes.

. . . meets demand for high production of parts previously requiring expensive and lengthy machining and polishing to hold dimensional tolerances and finishes.

. . . in many cases form in one piece a part formerly requiring several components.

. . . maintain the same wall thickness with smaller or larger diameters **on the same tube.**

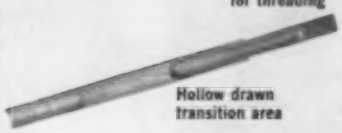
. . . form cylindrical sections with heavy wall sections at one or both ends, or in the center to provide for bearings, threads, weldments, etc.

. . . require only the exact amount of material necessary to produce the parts.

. . . on heavy sections, maintain the same O.D. as the tube body, with smaller I.D., or larger O.D. with same I.D., or both.

. . . increase tensile strength and improve grain flow by cold working and eliminating heat-treating.

NOTE: Heavy end for threading



Hollow drawn transition area

Lockheed PITOT MAST

The flotrusion process is readily adaptable to the construction of many diversified parts used in the missile and aircraft industries for both airborne and ground equipment.

Our staff of specialized engineers is available to show how this highly flexible process can—**REDUCE COSTS, SAVE WEIGHT,** and **SIMPLIFY** your **PRODUCT.**

Your inquiry is invited.

FLOTRUSION, INC.

1733 FLOWER STREET
GLENDALE 1, CALIFORNIA

A Division of DARCO INDUSTRIES, INC.

definitely so that his employer will not be taking a risk? The employee has no guarantee that the job he is about to begin is worth several weeks of his time attempting to find out that it may not be up to his standards.

Withholding five day's pay is no safeguard against irresponsibility to begin with. If a person wants to walk out on a job before he has given it a fair trial he can do so without a pay check per se, but with far more damage to a concern than had he been given his earnings. When some people are about to leave a position, unfortunately and unethically, they no longer feel allegiance to it and they act accordingly. They take advantage of every opportunity to follow the laissez faire policy with regard to work. Occasionally they go so far as to pilfer some of the tools or they may help themselves to some of the production items. In rebellion they often resort to that frequently misused weapon, the tongue. With this they can do irreparable damage in the form of calumny, slander and generally unsought-after remarks. These dangers might be avoided if the parting member felt that he had nothing coming to him.

These connivers are of the opinion that if they are caught in their act, the penalty cannot be great because they were going to leave anyway.

Checking carefully on a tradesman's references is a better solution to the problem under discussion. If he has had many jobs in a short interval of time, experience has shown that he is a poor risk. He is a "job hopper" for a reason that is usually not in his favor. It takes a little effort to uncover this information but in the long run it pays off.

Alex F Loughlin
Belturbet, Ireland

"Your first floor will be mostly coffee machines . . ."

NEW FILMS . . .

IT'S EASY TO BEND. *Produced by O'Neil-Irwin Mfg Co, 512 Eighth Ave, Lake City, Minn. 16mm, sound, color. Running time 17 min. No charge for loan, but available for sale.*

Following a brief review of basic metalworking operations, the film shows the principle and function of bending by giving examples of various product parts. A tool engineer then describes, by four case histories, how bending is important in the function, strength, and appearance of many products, and how it can reduce tooling and production costs.

Some of the basic types of bends and bending tools are then illustrated, and the selection of materials is discussed in relation to bending qualities. The film concludes with a step-by-step demonstration of bending procedures, and a review of the role of bending in modern manufacturing.

•

TRANSFER FEED PRESSES IN THE APPLIANCE INDUSTRY. *Produced by E W Bliss Co, 1375 Raff Road, S W, Canton 10, Ohio. 16 mm, sound, color. Running time 15 min. No charge.*

Production of refrigerator crisper pans on a 700-ton transfer press at the rate of 12 per min is documented in this new picture. Every step, from the coil on the cradle, right through the 13 stations, to the delivery of the finished pan, is covered in detail. The die work, the coil cradle, the transfer mechanism, are of particular interest to anyone considering automated presswork.

•

MAKING A WORK SAMPLING STUDY. *Produced by University Extension, University of California, 10851 Le Conte Ave, Los Angeles 24, Calif. 16 mm, sound, color or black & white. Running time 23 min. Price, color $195, b & w $110.*

Designed to give business and management a better understanding of some of the problems of management and methods of solving them, the film opens with a statement of a

Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributors: Bethlehem Steel Export Corporation

Hundreds of red-hot wrenches per hour formed and broached with 57 HW

Forming and broaching twelve-point openings in box wrenches from red-hot alloy steel bars is a job that calls for a hot-work tool steel having a high red-hardness . . . good resistance to abrasion . . . and the ability to take shock.

Our 57 HW grade meets these tough requirements—and then some—at P & C Tool Co., Milwaukie, Oregon. Hardened to Rockwell C-50, the die turns out wrenches from rounds of special alloy steel, similar to 4140 grade. After producing approximately 3500 wrenches, the punches and dies are polished with an emery roll, putting them in good shape for some more of the same rugged service.

57 HW is our 9 pct tungsten type of hot-work tool steel. Hardened in air, it has both high red-hardness and high abrasive-resistance. Moreover, it offers good resistance to heat-checking, and more than holds its own in resisting shock.

Typical Analysis

Carbon 0.35	Tungsten 9.35
Chromium 3.25	Vanadium 0.50

57 HW is ideal for a variety of hot-work applications—everything from hot headers to spike cutters, from punch-and-die inserts to nut piercers. Why not let a trial run convince you? Your Bethlehem tool steel distributor is awaiting your call.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Take a Good Look At Your Grinding Marks

Some people are surprised to learn that grinding marks often play a big part in determining tool life. This is especially true with deep-hardening dies and punches that have a moving contact with metals under high pressures. Although the surface finish of a ground tool may appear smooth, it actually has a saw-tooth contour. Material moving in the same direction as the grinding marks shows less tendency to "pick-up" or adhere, than material which travels across the grinding marks.

This "pick-up" of material is not desirable on such tools as drawing dies. Here it is advantageous to grind in the same direction as the material is to move. On some types of tools this kind of grinding is difficult, but because of the longer tool life obtained, the effort is worthwhile.

Punches which have been ground longitudinally outlast those which have been ground circumferentially, though the latter is by far the most common method. Here, too, longitudinal grinding pays off, even though it may be inconvenient.

It's well to give serious thought to the direction of grinding on tools. It can make a big difference in getting the best possible tool life.

It's just off the press—a completely new two-color booklet on Bearcat tool steel. The booklet is profusely illustrated, and explains fully why Bearcat is such an outstanding grade for a wide variety of shock applications. If you would like to have a copy for reference, write to Publications Dept., Bethlehem Steel Company, Bethlehem, Pa. Ask for Booklet 458.

STEEL from Wheelock, Lovejoy BULLETIN

W-L CHICAGO Now in an ideal position to supply HY-TEN "M" Temper in large forged flats up to 6 x 22", rounds to 18" and squares to 17½". Also "B" No. 3-X in large forged flats to 6 x 13", rounds to 18" and squares to 16". Alloy forgings a specialty.

W-L DETROIT The new, larger warehouse and office here have greatly speeded up delivery on our orders and services in this area. Have a good stock of A-8620 on hand as well as all HY-TEN grades.

W-L CLEVELAND The rolls for this Vaughn Four-Roll Continuous Pointer are fabricated from HY-TEN "M" Temper, nickel-chromium-molybdenum oil hardening steel. This Pointer, largest of its type in the world, can point rods ranging from ½" to 1¼" dia. HY-TEN "M" was selected by the machine manufacturer because it can be quenched and tempered to high hardness levels while retaining considerably greater toughness than would be possible with most other steels.

W-L CINCINNATI Another new and larger warehouse recently opened here. Same-day service on all sizes, shapes and grades of HY-TEN, plus our usual help on metallurgical problems.

W-L HILLSIDE, N. J. This W-L warehouse has an excellent stock of HY-TEN "B" No. 3-X in rounds, flats and squares. Same-day delivery is promised. Many of the larger sizes of forged rounds are rough turned.

W-L CAMBRIDGE HY-TEN "B" No. 2 is still a great favorite in New England for parts requiring medium duty and high quality at a reasonable price. Our research and development assure better HY-TEN specials — "the standard alloy steels of tomorrow."

W-L BUFFALO New HY-TEN "B" No. 3X-40 now available here in rounds ½" to 8¼" and hexagons 1¼" to 2¾", heat treated to 300 Brinell. Machines as easily as heat-treated 4140 leaded, but less expensive. Suitable for flame or induction hardening — tough and shock resistant.

Write our Cambridge office today for your *free* Wheelock, Lovejoy Data Sheets. They'll give you complete technical information on grades, applications, physical properties, tests, heat treating, etc.

WHEELOCK, LOVEJOY & COMPANY, INC.
137 Sidney Street, Cambridge 39, Mass.

AMERICAN STEEL WAREHOUSE ASS'N

AGENTS: Southern Engineering Company, Charlotte, N. C.; Sanderson-Newbould, Ltd., Montreal & Toronto

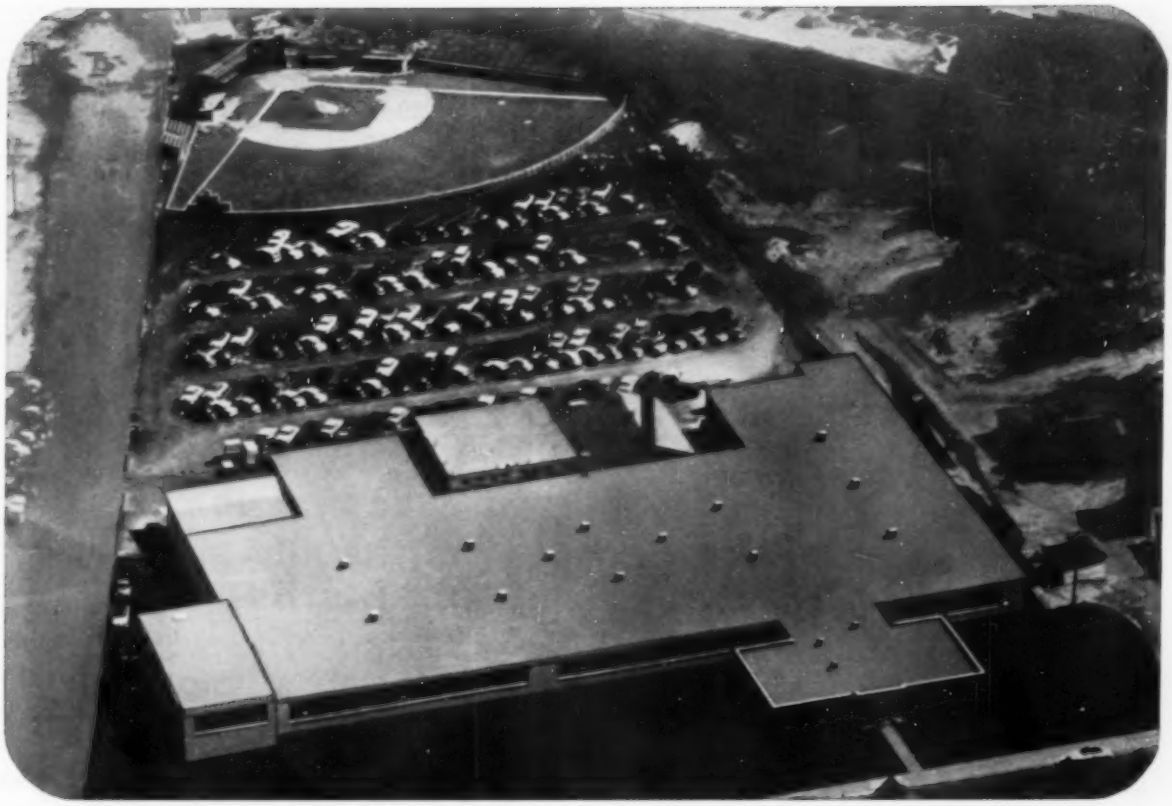
manufacturing problem. Top management needed to know the utilization factor for each production line in a factory. Work sampling was selected as the best means of obtaining the facts. Some of the steps used in making the work sampling study are: definition of the problem, preparatory steps, designing the study, making the observations, analyzing and summarizing the data, and reporting the results. Although complete in itself, the film logically follows the showing of "Introduction to Work Sampling," also produced by University Extension.

•

HIGH PRODUCTION PRESS MAINTENANCE. *Produced by E W Bliss Co, 1375 Raff Road, S W, Canton 10, Ohio. 16mm, sound, color. Running time 25 min. No charge.*

Proper maintenance procedures for high-speed presses are presented in this new film. Correct lubrication, feed adjustments, and checking of clearances show users how to insure long life for press and dies. Also shown is the step-by-step construction of a press. Perhaps the most important feature, fast, simple, die changeovers, shows how die changeovers can become so easy that it actually pays to change dies for short runs.

"That can of stuff without a label you gave me—I found out what it was."



Bridgeport builds.....

IN the foreground above is the factory where "BRIDGEPORTS" are produced . . . milling machines as accurate and versatile as we know how to make them, adaptable to small and large shops alike. However, fabrication of cast iron and steel into these modern machines is only part of the story . . . the human element is also vitally important.

For evidence of this, look closer at the picture. Note in the background Bridgeport Machine's "Little League" ball field. Here character and sportsmanship are being built so that today's youth may be tomorrow's leaders in the community, here and elsewhere . . . through training, ability and teamwork taught on the ball field.

All of us here at "Bridgeport" are justifiably proud that we were able to provide facilities for developing a ball team that won the Eastern "Little League" Championship and were only one "break" away from the "World's Championship" in its semi-final game with the Monterrey, Mexico team.

You, our customer, and the dedicated leadership of "Little League" baseball, share with us the success of "Bridgeport" little league players.

Building good machine tools in the plant has been rewarding, but of even greater importance is the building of character and sportsmanship in the youth of today. They are America's greatest asset.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

it's a job for CDT

Faced with a special tooling job? Stymied by a tough problem? Would 50 years of experience help? Then the logical answer for you is to send it to Columbus Die-Tool! CDT specializes in tools, jigs, fixtures and also special machinery, designed and built to produce your products better, faster, and more economically.

That's why so many of the nation's leading manufacturers avail themselves of the specialized services of Columbus Die-Tool. Perhaps CDT can solve your tooling problem and help you make your product . . . better for less.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • also Builders of Machine Tools Complete

IMPORTANT

INFORMATION ON

hydraulic remote controls for **throttle** and **clutch mechanisms!**

This newest bulletin is packed with important data! Sperry Hydraulic Remote Controls are available in standard and special types for use with feed, valve, throttle, governor, variable speed and clutch controls.

Send for your copy today. Just clip this ad to your letterhead, give your name and title, and mail to:

Sperry **SPERRY PRODUCTS, INC.**
203 Shelter Rock Road, Danbury, Conn.

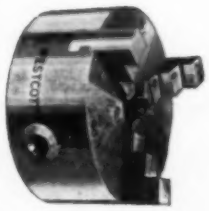
HOLD IT . . . *Mister!*

WITH A **WESTCOTT CHUCK**

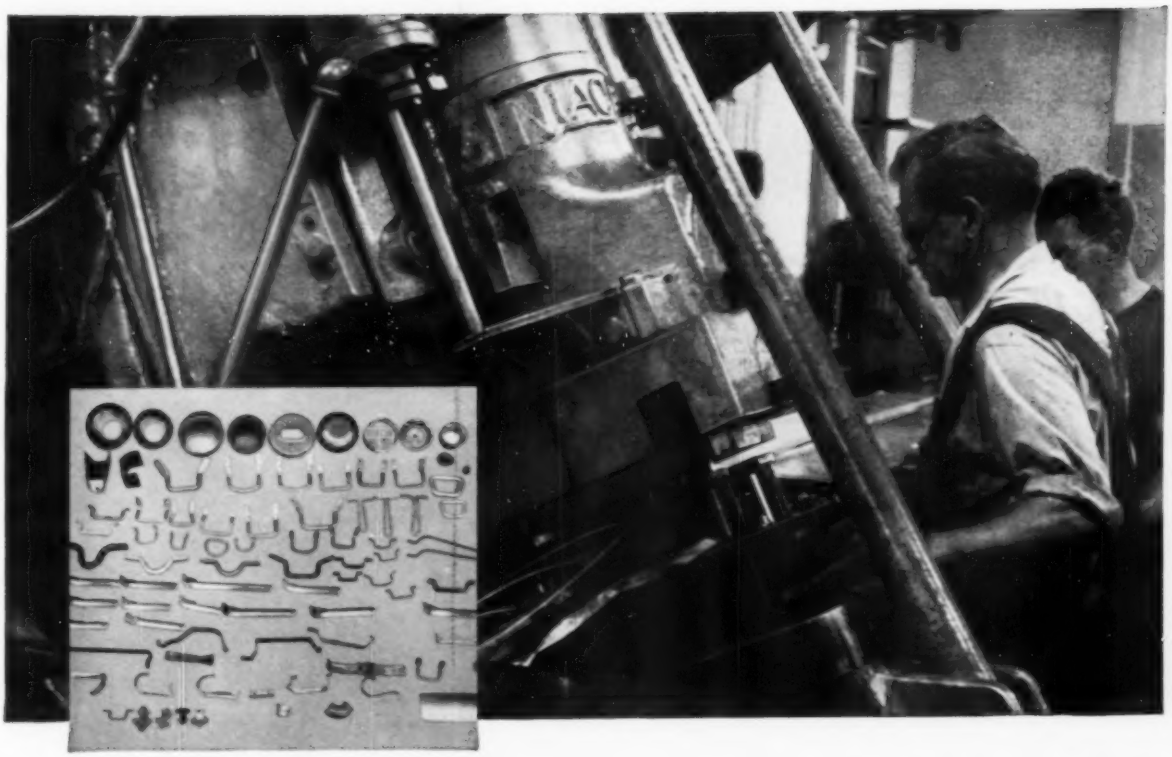
TOP QUALITY CHUCKS SINCE 1872

- **PRECISION MANUFACTURED**
- **UNIVERSAL CHUCKS: .003" guaranteed accuracy**
- **SEND FOR CATALOG**

Sold by Industrial Distributors from Coast to Coast



ONEIDA MACHINE TOOL CORPORATION
400 E. WALNUT STREET • ONEIDA, N. Y.



"We stamp them all using just 2 Cities Service Oils!"

Presses shift to numerous operations without ever changing oil, thanks to versatility of the 2 Cities Service oils used for all jobs.

Handles by the thousands are produced by Res for cooking utensils and similar items. Finish is excellent, thanks to Cities Service oil.

...says Res Manufacturing Company Milwaukee, Wisconsin

It's doubtful if anyone makes a more diversified line of stamped and formed metal products than Res Manufacturing Company.

With its 21 presses, ranging from 15 to 200 tons capacity, Res turns out millions of articles a year . . . wire handles, metal handles, wire forms, drawn shells, lifting loops, and parts for electrical controls, to mention just a few.

"All require the best possible finish and all get it with the use of just two Cities Service oils," says Assistant Plant Manager Herbert W. Krueger.

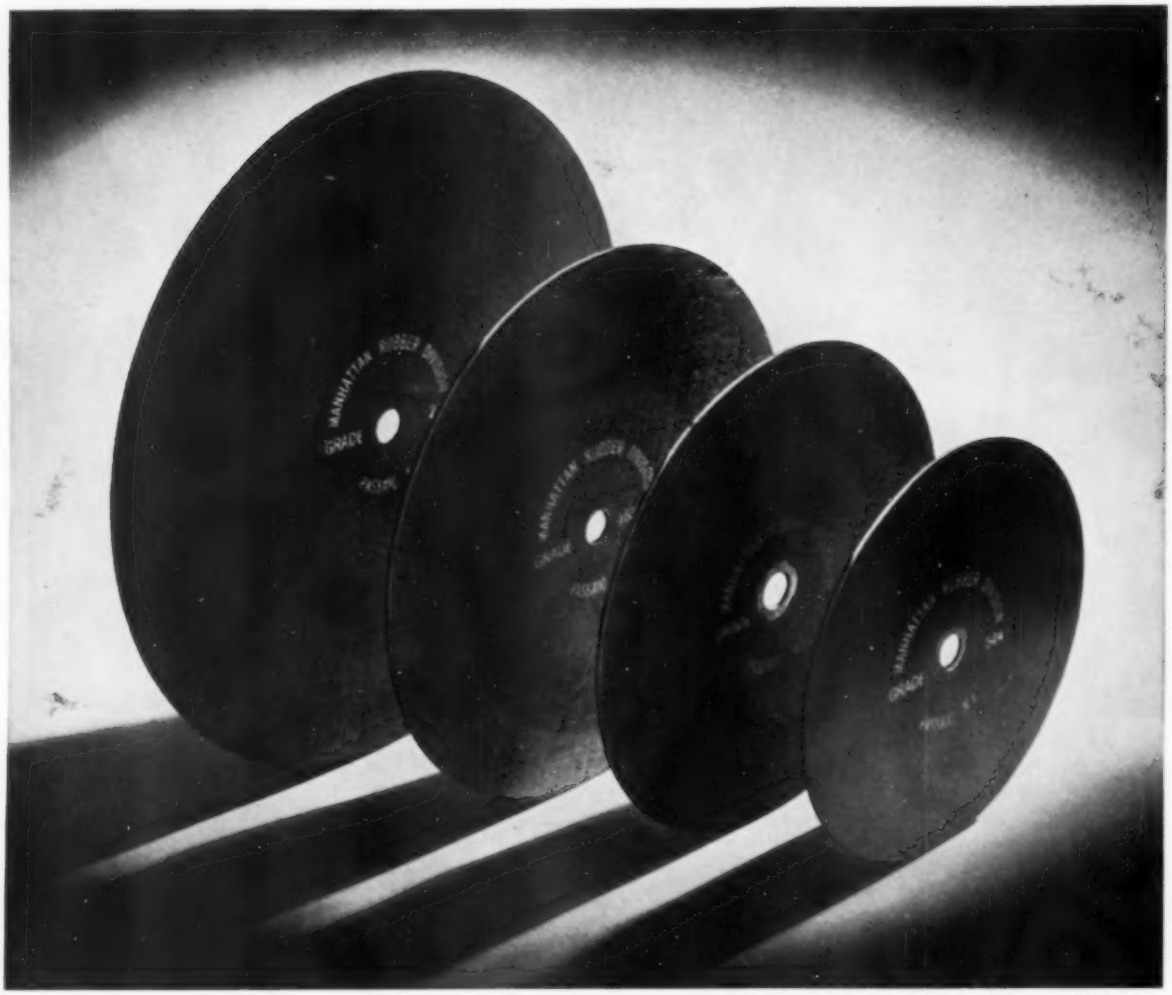
"For drawing, shaping, and punching aluminum, we use Cities Service Chillo #2 with excellent results. Where drawing, swedging or forming of steel and brass is required, we use Cities Service Chillo 12 and get equally fine results.

"Not only do these two Cities Service oils handle all our jobs and produce the best possible finish, but we also find they increase tool life and hold scrap to a minimum. In short, these are the best oils we have ever seen."

Like Res Manufacturing, chances are your operation can be simplified with the right Cities Service oils. Talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Cleaner Cutting — Longer Life

MANHATTAN CUT-OFF WHEELS

Recent Manhattan developments in rubber and resinoid bonds have greatly increased the cutting efficiency and service life of Manhattan Cut-Off Wheels. That's because *every* wheel is custom-bonded for your particular cut-off operations . . . on hardened steel, soft steel, light gauge tubing or critical alloys. Factory records of the number of cuts per wheel have proved they last longer than other wheels . . . and proved they cut cleaner and cooler.

Manhattan Cut-Off Wheels are made to your order in the widest range of types and sizes. Manhattan sales engineers are prepared to assist you in determining the best one for your job. Let a Manhattan Abrasive Wheel engineer show you how you can save time and money — get "More Use per Dollar" . . . with Manhattan Cut-Off Wheels and other types of high speed, heavy duty wheels at your plant.

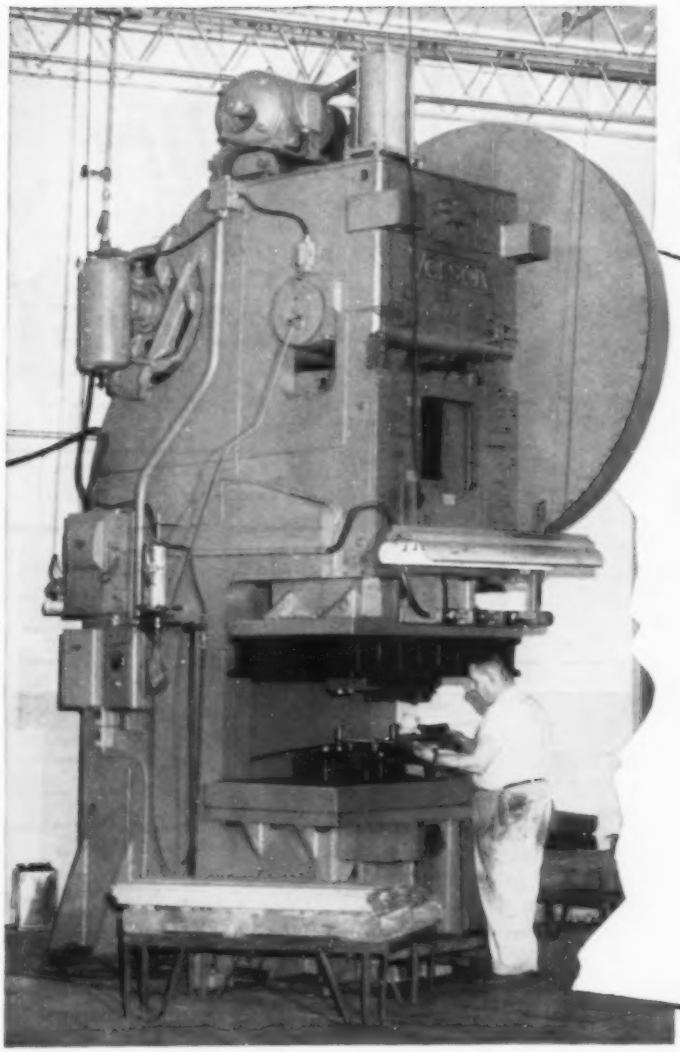
RM 842

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls



A Verson Press user reports on versatility:

"...it would be an almost impossible task to list all of the usages to which our

Verson Gap Press

is being subjected"

General Manager
John Blue Company, Inc.

We at Verson often talk of the versatility of our presses and the advantages they offer anyone engaged in the press forming of metals. This is more than just talk . . . it is an established fact, attested to by a host of satisfied customers.

The above excerpt is from a letter recently received from Mr. W. D. Tucker, General Manager of John Blue Company, Inc., Huntsville, Alabama, a leading manufacturer of farm equipment. Mr. Tucker goes on to say that since the Verson Gap Press is the largest in the plant, it is put into service on practically every application including drawing and forming steel shapes, multiple forming, punching and shearing operations.

The machine is a Verson 10-F Gap Press of 250 ton capacity. It has a 10″ stroke with a 5″ power adjustment and operates at 30 strokes per minute. Area of the flanged slide is 34″ x 52″ . . . the area of the bolster, 36″ x 62″. The press requires floor space of 135″ x 73″, is 186″ high and weighs approximately 64,000 pounds.

If you'd like further proof of Verson versatility, talk to other Verson Press users. You'll come away realizing that here is more than just a press . . . here is a production process, engineered and built to provide greater efficiency and production . . . higher profit potential. Put Verson's know-how to work for you. Send an outline of your needs.

178

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9316 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

81-Block
REFERENCE SET

VK "Quality in Millionths"

VAN KEUREN RECTANGULAR GAGE BLOCKS

Thirty-eight years of experience in manufacturing gage blocks plus the finest in modern measuring instrumentation produce the *"Quality in Millionths"* evident in VK rectangular gage blocks.

These gages are the end product of many skills developed over a long period of time. Final accuracy is controlled by absolute measurement of our master standards on the latest design Zeiss Interferometer, and by comparison with masters calibrated by Interferometry at the National Bureau of Standards, Washington, D.C. VK gage block measurements are made in a modern Gage Room in which temperature is held to 68° ± .1°F. Surface finish is inspected by a Zeiss Interference Microscope.

Van Keuren rectangular gage blocks are offered in Class A (± .000004") and Class B (± .000008") accuracy. They are guaranteed for length, flatness, parallelism, surface finish, hardness and stability. A certificate showing the exact size of each block is furnished with all Class A sets.

The tolerance on VK microgages has again been halved, and all microgages are now furnished to +.000008" —.000000", at no increase in price. Tolerance is all plus to provide necessary wear allowance on working blocks.

VK MICROGAGES

Set M35L Price $120.00

For "working" gage blocks we recommend VK ⅞" diameter microgages in the new Class "A" (+.000008" —.000000") accuracy. These gages are available in 16 sets, including the 35 block set shown above, and the valuable set M81 at $250.00.

VK

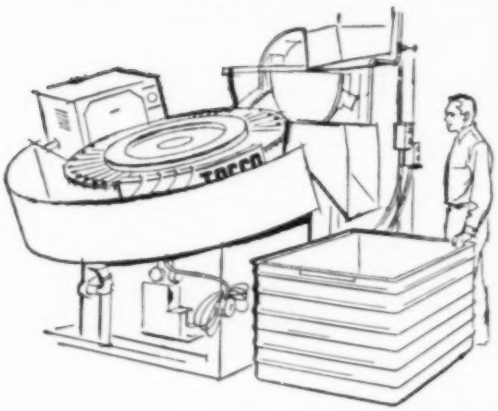
39th YEAR

THE Van Keuren CO.

173 WALTHAM STREET, WATERTOWN, MASS.

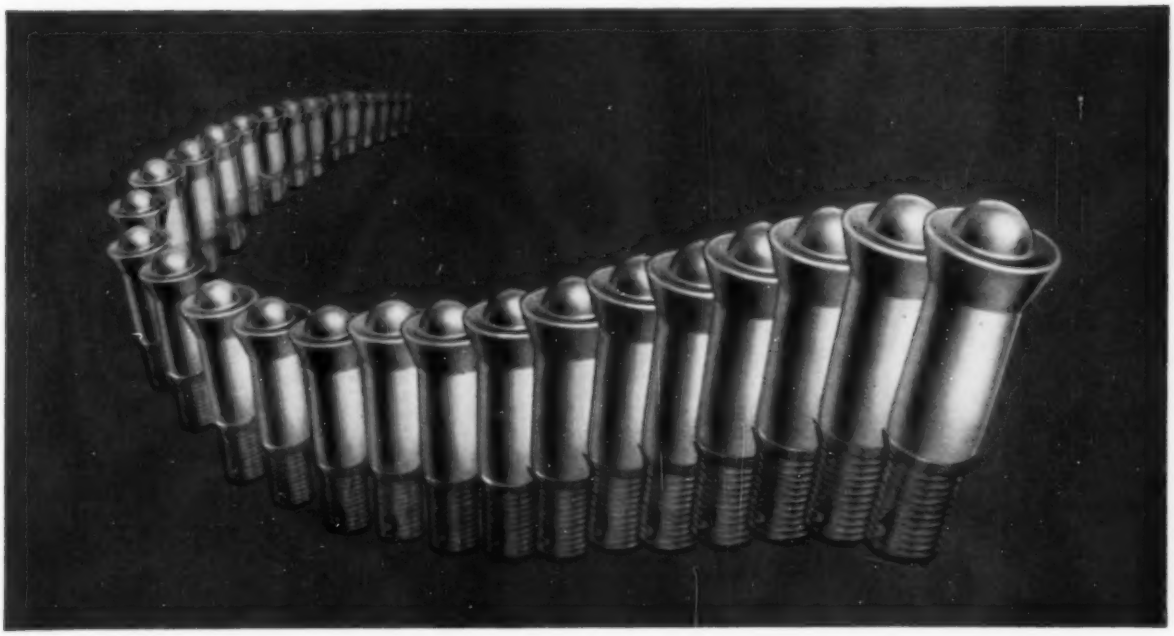
Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Carbide Pivots . . . Precision Lapping Service.

THOMPSON PRODUCTS **ANNEALS THREADS ON BALL STUDS**



ONE A SECOND!

with TOCCO* *Induction Heating*



Up Goes Production—When progressive engineers at Thompson's Michigan Division switched from conventional gas annealing to fully automatic TOCCO for annealing threads on automotive ball studs, production jumped from 2128 to 3226 parts per hour—an increase of over 50%.

Localized TOCCO heating draws threads from 60 to 30 Rockwell C, using 50 kw at a frequency of 10,000 cycles per second.

Down Go Costs—While production zoomed, costs dropped sharply with TOCCO annealing—a reduction of 34% in direct labor costs alone. With an average monthly output of 350,000 of these parts, Thompson saves thousands of dollars per year with TOCCO.

If you heat metal parts for annealing, forging, brazing or hardening, investigate how TOCCO can up *your* production and lower *your* costs.

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today— **NEW FREE Bulletin**

The Ohio Crankshaft Co. • Dept. B-3, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening, Heat-Treating and Annealing".

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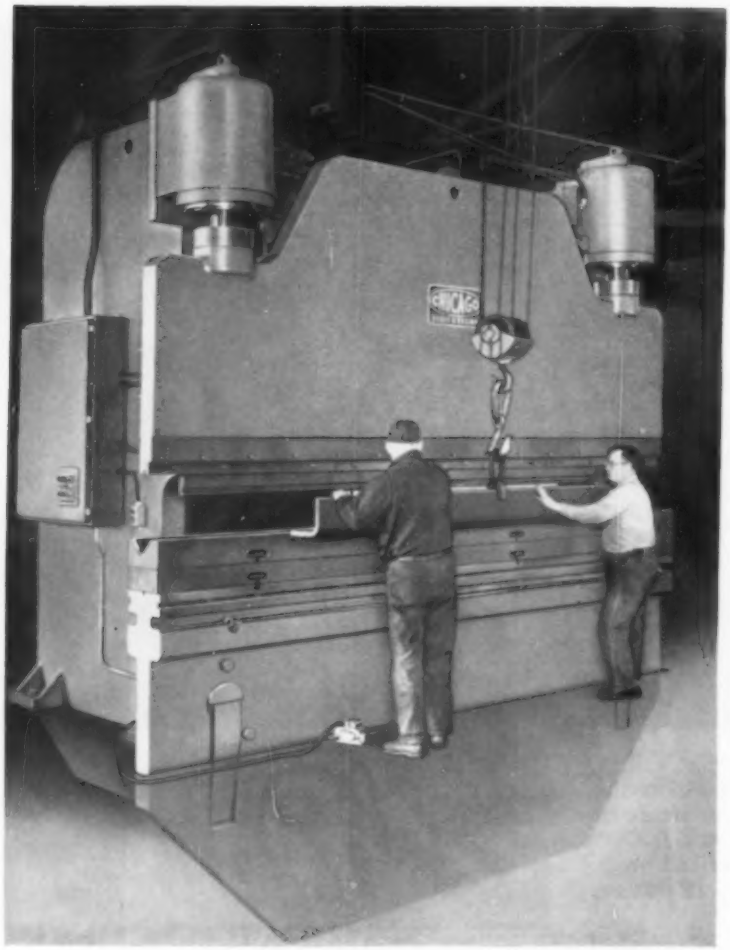
new

CHICAGO
DREIS & KRUMP

HYDRAULIC PRESS BRAKES



Capacities 300 to 2000 Tons

- New - Improved Sensitive Level Control
- Variable Ram Speeds Pressing - Return
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- Range
- Accuracy
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Complete details or recommendations for any job on request

Press Brakes · Press Brake Dies · Straight-Side-Type Presses · Hand and Power Bending Brakes · Special Metal-Forming Machines

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8329

LEADERSHIP at work

TF Series mill speeds DC-8 Jetliner toward take-off With G. L. Lyons at the controls, this Kearney & Trecker-Milwaukee Model 650 TF Series mill helps usher in the jet era of air transport. It's shown performing a precision milling operation on a stainless steel wing section for the wind-tunnel model of Douglas Aircraft's new DC-8 Jetliner. The 650 TF machine is just one of 48 models in the only knee-type line in the world with twin elevating screws.

KEARNEY & TRECKER MILWAUKEE

6786 W. NATIONAL AVE., MILWAUKEE 14, WIS.

Kearney & Trecker staff photo by Ron Johnson

K&T's man on the job . . .

D. E. (Tobey) Tobias of Moore Machinery, Los Angeles—helped Douglas in their selection of several TF's. *For expert milling counsel, call the K&T man near you. And remember to ask him, or write direct, for free, comprehensive catalog.*

FOR A REAL GRIP

USE UNIVERSAL COLLET CHUCKS

A sure, solid grip on tools is provided by the wrap-around action of Universal chucks because the slotted collet grips the tool on a continuous surface the full length of the collet. Tools can't slip and tool shanks don't get scored. Even tool stubs and broken drills can be used successfully. Sizes range from 1/16" to 1 1/2", with shanks to fit any machine. Simplified design results in low chuck cost to you. Write today for new "complete line" catalog.

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UNIVERSAL ENGINEERING CO. FRANKENMUTH 1, MICHIGAN

More pieces per man-hour in your plant can start right here

If you want to get more out of your man-power, think *first* of power chucking . . . on the machines in your shop or the lathes you are planning to buy.

The successful application of power chucking to your machines and your work calls for highly specialized and imaginative engineering know-how. Skinner puts by far the largest engineering team in the industry at your service through your nearby Industrial Distributor. Put your power chucking problems up to him, or, if you prefer, write directly to our engineering department.

For information about Skinner's complete range of basic power chucking equipment, write for catalog to Dept. 103.

SKINNER CHUCKS

THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

Why the Die Maker Prefers PRODUCTO Die Sets

Volkert Stampings, Inc.

The die maker likes to work with Producto Die Sets

He knows Producto die sets are easy to assemble —especially those equipped with the unique new Qwik-Fit Guide Pins*.

He has confidence in the consistent accuracy of Producto sets. He has found that they always align his dies correctly.

He knows he can choose from a variety of thicknesses the Producto die set that meets the strength requirements of his die.

He favors Producto die sets because they are dependable. They will perform on the press as well as they did in tryout.

He likes the attractive, streamlined appearance of Producto sets. They make his dies look better and increase his pride in these products of his craftsmanship.

*Patent Pending

He knows that a nearby Producto warehouse can supply any catalog die set he needs...and that orders for specials are promptly processed. He can count on having the die set by the time he needs it.

The die maker has found that all of his requirements are met by Producto die sets. You will, too, when you place your order with Producto.

DIE SET DIGEST, our eight-page quarterly, contains valuable data for designers, makers and users of dies. Write to have your name added to mailing list.

THE PRODUCTO MACHINE COMPANY
975 Housatonic Ave., Bridgeport 1, Connecticut

PRODUCTO

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

Waldes Truarc GRIP RINGS Replace Expensive Parts... Reduce Manufacturing Costs...Eliminate Rejects

WALDES TRUARC SERIES 5555 GRIP RING*

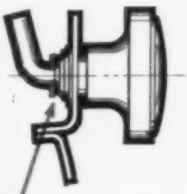
application: external for shafts

range: .077 in. — .755

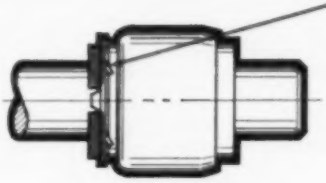
The Waldes Truarc Grip Ring requires no groove, holds fast by friction forces, can be used again and again. It provides a positioning shoulder secure against moderate thrusts or vibration. The ring's unusually large radial width exerts considerable frictional hold against axial displacement.

*U. S. Pat. No. 2,574,034

Rings cut costs 33%, eliminate rejects

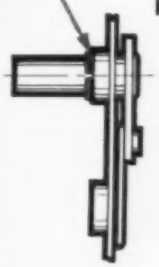


B & J Tool uses series 5555 grip ring to secure parts of damper control made for Vulcan Radiator. Shaft formerly was machined down to provide coil spring shoulder, often broke during bending operation. (Rejects ran as high as 80%!) New design eliminated rejects and field failures, cut production costs 33%.



Rings save $300 per die, $.03 unit

Ray Oil Burner Co. uses a Truarc series 5555 grip ring in fuel pump drive shaft to position seal and drive it to assure continuous rotation with shaft. Original design used complicated die-cast collar and driver which required special groove and shoulder. Savings: $300 per die for each size manufactured, $.03 per part.



Rings save $32.42/M:

Swift Business Machine Co. replaced collars and set screws in hollow shaft assembly of its adding machine with series 5555 grip rings, saving $32.42 per 1000 units. Rings require no groove, make possible positioning adjustments without slippage encountered when set screws were used.

Whatever you make, there's a Waldes Truarc Ring designed to save you material, machining and labor costs, and to improve the functioning of your product.

In Truarc, you get

Statistically Controlled Quality from engineering and raw materials to the finished product. Every step in manufacture watched and checked in Waldes' own modern plant.

Complete Selection: 36 functionally different types. As many as 97 standard sizes within a ring type. 5 metal specifications and 14 different finishes. All types available quickly from leading OEM distributors in 90 stocking points throughout the U. S. and Canada.

Field Engineering Service: More than 30 engineering-minded factory representatives and 700 field men are at your call.

Design and Engineering Service not only helps you select the proper type of ring for your purpose, but also helps you use it most efficiently. Send us your blueprints today . . . let our Truarc engineers help you solve design, assembly and production problems . . . without obligation.

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Please send new, descriptive catalog showing all types of Truarc rings and representative case history applications.

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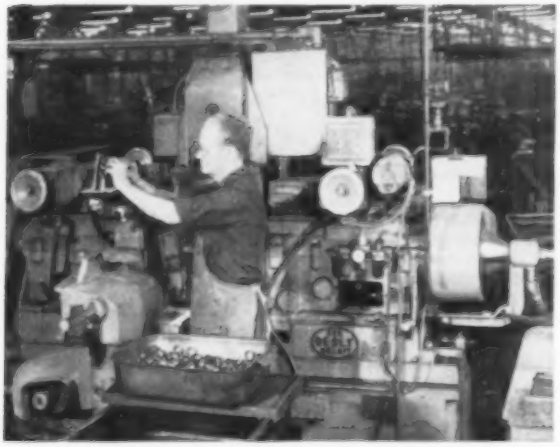
AM-030

Consult the Yellow Pages of Your Telephone Directory for Name of Local Truarc Factory Representative and Authorized Distributor.

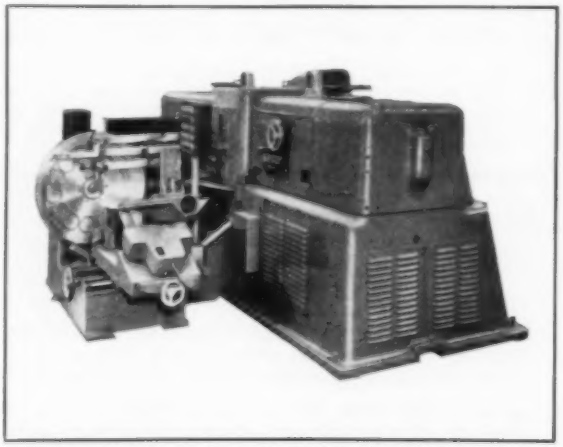
Grinding Methods . . . by BESLY

100% MORE SPRINGS AT ⅓ LESS COST—W. D. Gibson Company, Chicago, uses a Besly 918-30" Tandem Special Grinder to rough and finish grind springs on both sides in one pass. Two sets of opposed discs, separately driven, are employed. Production has doubled, costs are cut one-third and one operator used now vs. two on the previous set-up. Combined oscillating and rotation action of an eccentric type feedwheel results in longer disc life and less frequent dressing, permits automatic loading, unloading. Besly makes 5 types of grinders in this 900 series employing single or double vertically driven discs in sizes from 18" to 53", for grinding parallel surfaces of small parts. Adaptations to your work are readily made by fully experienced Besly engineers.

RADIAL TILE GRINDING—A. P. Green Fire Brick Company, Mexico, Mo., uses a Besly 630-26" Double Horizontal Spindle Disc Grinder to precision finish the mating edges of radial refractory tile for assured perfect fit. Adjustable spindle head and motor assemblies (up to 30°) attain proper angles. Grinds tile, concrete block, cylinder heads, tubs, etc.



PARALLELISM IN ONE PASS—International Harvester's West Pullman Works, Chicago, uses a Besly 226-30" Double Horizontal Spindle Disc Grinder to finish grind difficult bearing races to .0004" parallelism in one pass. 50% to 60% more production by one man, at lower maintenance and less scrap are also gained. Hopper feeding, power dressing and automatic sizing are available in 5 sizes of this grinder to handle abrasive discs from 23" to 72". Feed or other details can be Besly engineered to meet your needs.



GRINDS WITH PUSH-BUTTON SIMPLICITY—High production, extreme accuracy, automatic controls are featured in the Besly 240-30" Double Horizontal Disc Grinder. New design cuts set-up, abrasive changing and dressing time. Here, it grinds over 400 piston rings per minute to .0002" parallelism. Electro-magnetic rotary pick-off feed automatically delivers rings continuously between abrasive wheels. Grinds piston and bearing rings, transmission plates and similar shapes with equal rapidity to as much as .0001" parallelism.

Besly offers more than 82 years of disc grinding experience to help solve your grinding problems. If you want to cut costs and increase production, Besly Engineers can show you how to make worthwhile savings with the correct grinder or abrasive for the work. Bulletins describing Besly Grinders or Abrasives are available on request. Ask a Besly Engineer to analyze your grinding needs for better results.

Engineering, Service and "Specials"... are a Besly Specialty

BESLY

BESLY-WELLES
CORPORATION
Est. as C. H. Besly & Co. 1875
120 Dearborn Ave., South Beloit, Illinois

BESLY GRINDERS and ACCESSORIES • BESLY-TITAN ABRASIVE DISCS and WHEELS • BESLY TAPS • BESLY X-PRESS® TAPS, GAGES, DRILLS, REAMERS, END MILLS • BESLY CARBIDE TOOLS

From Midget to Monster

WILLIAMS WRENCHES *fit the job**

In scale comparative illustration — Actual openings: Midget 3/16". Monster 3 1/8".

ALLOY WRENCHES

A complete selection from 33 patterns, 400 sizes with openings from 3/16" to 3 1/8". Drop-forged from selected alloy steel and heat-treated for maximum service. Quality chrome plated finish.

CARBON WRENCHES

From a tiny 2 1/2" to a giant 52 inches long — there are 29 patterns, 542 sizes with openings from 3/16" to 7 5/8". Correctly designed, they are made from selected carbon steel drop-forged and heat-treated for extra strength. Finish is black enamel.

***Over 95% of your wrench requirements are stock items in THE BROADEST LINE OF ITS KIND.**

WILLIAMS
DROP FORGED
TOOLS OF INDUSTRY

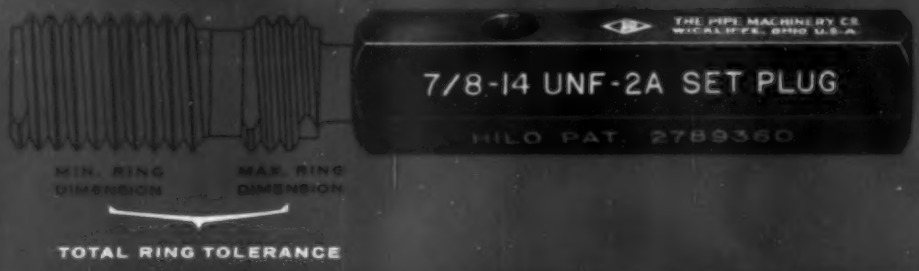
FOR PROMPT, PERSONAL SERVICE

INDUSTRIAL DISTRIBUTORS — THE RIGHT HAND OF PRODUCTION

CALL YOUR LOCAL DISTRIBUTOR

J. H. WILLIAMS & CO.
408 VULCAN STREET
BUFFALO 7, NEW YORK

You Can Bank on PIPE MACHINERY Hilo Set Plugs for 4-Way Savings



SAVE TIME

Now, your thread ring gages or other adjustable instruments for the inspection of male threaded parts can be checked with amazing speed. Pipe Machinery Hilo Thread Setting Plug Gages are designed with two different diameters having identical lead and angles. The smaller diameter is made to the extreme low limit of the tolerance indicated—the larger diameter to the extreme high limit. If the front or low limit end enters, and the back or high limit end stays out, the ring is the proper size. It's just that simple—just that fast!

SAVE ARGUMENTS

You no longer need rely on the human element—on the individual operator's sense of feel. With Hilo Set Plugs there's no guesswork, no cause for debate or argument as to what constitutes a snug fit or acceptable shake.

SAVE RING GAGE LIFE

With these revolutionary plugs you utilize all the wear life built into your adjustable gages—never discard them unnecessarily. You reject them instantly and positively when the ring is out of limits.

SAVE MONEY

Last, but not least, reduction in costly inspection time, plus elimination of wasteful scrappage can add up to important dollar savings, too.

Why not put 4-way Hilo Plug savings into your assembly operation? Write today for additional information or stop in and see us next time you're in the vicinity. We'd be proud to introduce you to our team of craftsmen.

THE PIPE MACHINERY COMPANY

29100 Lakeland Blvd. • Wickliffe, Ohio

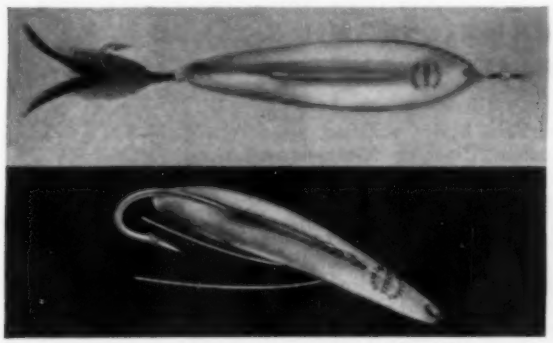
Greater Cleveland

NEW BRASS CUTS POLISHING COST

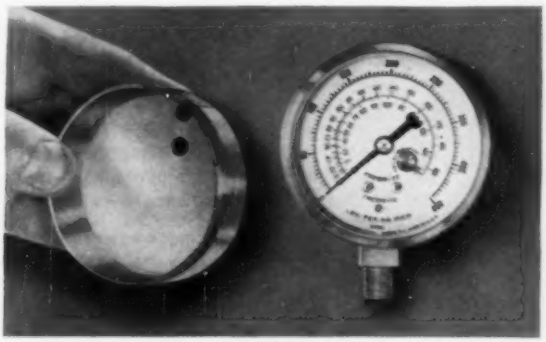
also gives you clean, easy drawing and forming, plus higher physical properties—Formbrite,® Superfine-Grain Drawing Brass by Anaconda

AIRGUIDE Instrument Co., Chicago, gets high luster finish on bezels for its famous weather instruments at 50% lower cost since it switched from ordinary drawing brass to Formbrite. Airguide does the presswork—says Formbrite "draws and forms excellently." Driscoll & Co. (above) polishes the bezels.

BAROMETER in Chippendale style, "Mayfair," is one of the broad line of brass-trimmed instruments made for home and marine use by Airguide.



FISHING LURES made by Williams Gold Refining Co., Inc.—"Wabler," top and "Weedler," below—are polished for plating by tumbling. Switching from ordinary yellow brass to Formbrite cut costs more than 40%.



MARSH Instrument Co., Skokie, Ill., dropped a finishing operation and gets a "mirror finish" with a light buff, by using Formbrite. Marsh reports that finishing cost was cut 40% and that forming is "excellent."

Wherever finishing is an important cost factor in formed or drawn products, Formbrite in sheet and strip is designed to save you money. In brass wire alloys for cold-heading and upsetting, it gives a stronger, springier, more abrasion-resistant product. For more detailed information, write for Publication B-39. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

1843

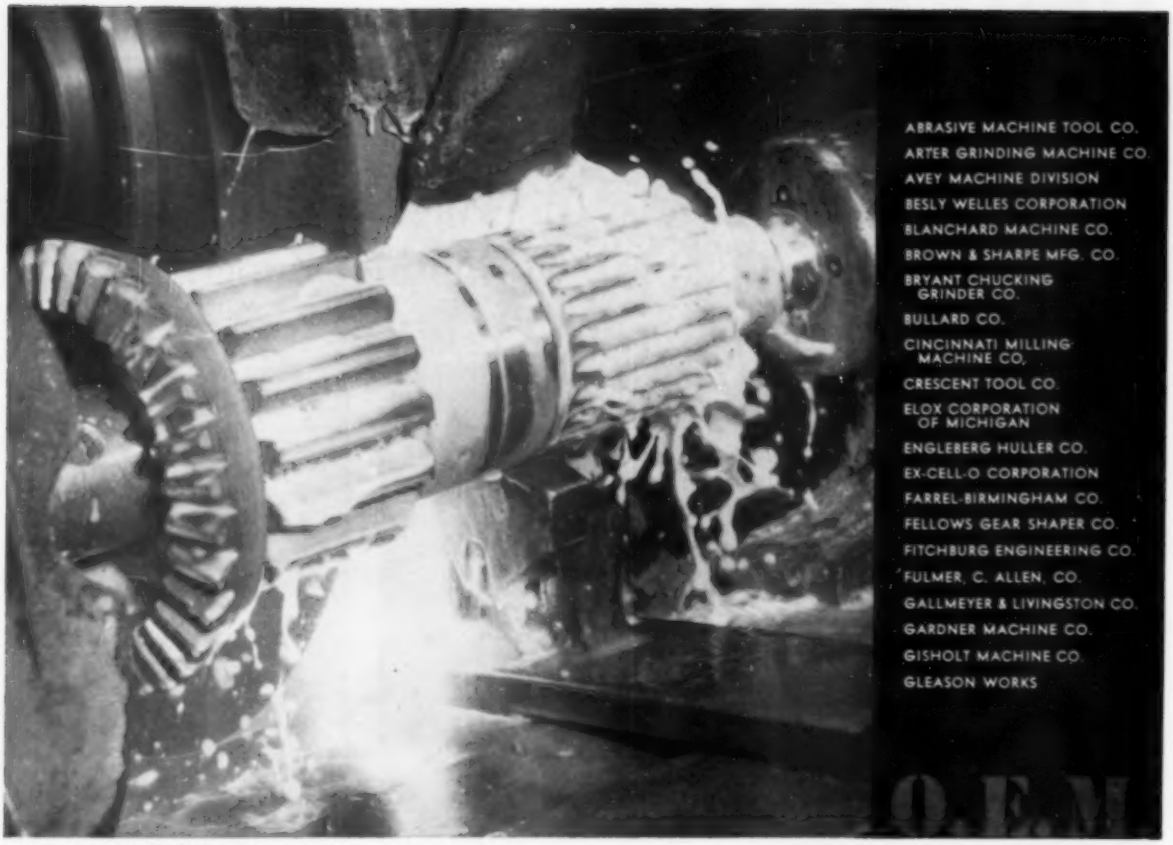
FORMBRITE

SUPERFINE-GRAIN DRAWING BRASS

a product of

ANACONDA®

Made by The American Brass Company



COOLANT SHOWN COURTESY JOHNSON'S WAX

A good way to insure satisfied machine tool customers—

furnish BARNESDRIL COOLANT CLEANING AS ORIGINAL EQUIPMENT!

These builders know customers are better satisfied when machines have Barnesdril Coolant Cleaning furnished as original equipment — because they get satisfactory machine performance over a longer period of time.

When machines are designed and built to perform specific operations held to close tolerances, customers expect these results *continuously*. This is possible only if initial operating conditions are maintained. Clean, conditioned coolant supply for these operations assures peak operating conditions with close tolerances and fine finish. As a result, machine performance is satisfactory over long periods of time.

Barnesdril also assumes responsibility for its Coolant Cleaning Units, installed as original equipment, and our regular sales and service policy applies with no cost to the machine builder. Why not ask Barnesdril engineers for full details on the benefits of Coolant Cleaning.

BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS
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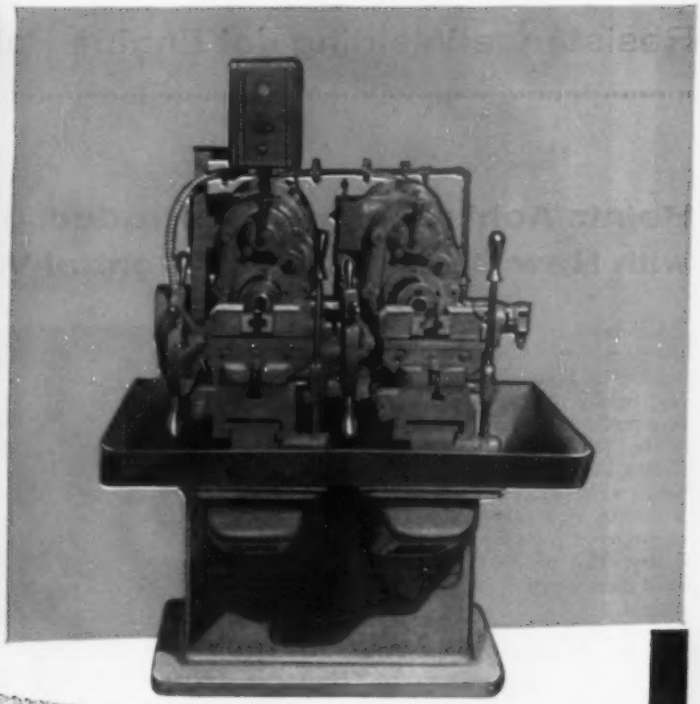
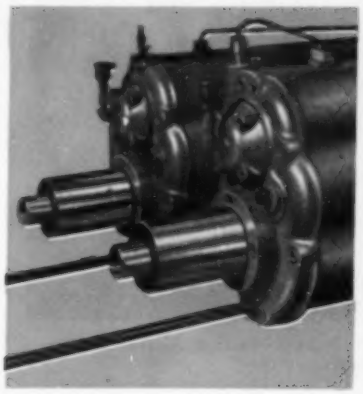
MANUFACTURERS OF MAGNETIC COOLANT SEPARATORS • KLEENALL SEPARATORS AND FILTERS • CENTRAL COOLANT CLEANING SYSTEMS

DOES YOUR PRODUCTION REQUIRE HORIZONTAL TAPPING?





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AND FLEXIBILITY
FOR LOW-COST OPERATION

Flexible operation assured throughout range of tap sizes by ease of speed changes.

Speedier production — resulting from reversing speed of 150% of tapping speed for all ranges.

Simple, easy set-up and operation, with fast, accurate performance.

Repair parts — readily available — no factory service men needed for repairs.

...then you need Cost-Cutting

Custom-Designed CAPCO 2-SPINDLE HORIZONTAL TAPPER

Now available at a standard machine-tool delivery time and price!

The only machine of its type now available for tapping pipe or tubular ferrous and non-ferrous metals too long to handle vertically, this "CAPCO" 2-Spindle Horizontal Tapper is designed and built for years of rugged service. *High production* is one of the outstanding features of the machine, operating at tapping speeds from 60 to 240 r.p.m., and to a maximum depth of 4". Ample power for toughest jobs is provided by the 5 h.p. motor. Mechanically operated jaw clutches assure performance to spare for driving all taps, right or left hand threads, up to and including 1⅞". Tough, hardened steel two-jaw vises accommodate work up to 2⅛" in diameter, holding without distortion.

Designed in a production plant for production operations, the new "CAPCO" 2-Spindle Horizontal Tapper is available at a price no higher than for equipment ordinarily sold on a standard machine time delivery basis.

WIRE — 'PHONE — WRITE —
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Resistance Welding Jet Engine Parts

SCIAKY

HELPS PUT PROFIT INTO MANUFACTURING

Heintz Achieves Volume Production with New Sciaky Counter Control Welders

In fabricating and job shops, where a wide variety of assemblies must be welded to rigid specifications every day, Sciaky resistance welding helps keep production schedules *on schedule*.

The Jet Engine Division of the Heintz Division, Kelsey-Hayes Company, a large Philadelphia contract fabricator, manufactures original and replacement parts for the aircraft industry. This means their production must meet exacting jet engine specifications.

New Sciaky Counter Control

To help meet these requirements, Heintz now uses Sciaky Patented Three-Phase Resistance Welders with the new Predetermined Electronic Counter Control. This new unit provides precise control of all welder functions for absolute production consistency. All control settings are realized with extreme accuracy, and are readily reproduced at any time to duplicate previous production runs. The machine cannot deviate from its setting.

Fig. 1 Seam welding Nimonic to Nimonic on Pratt & Whitney Aircraft J-57 afterburner diffuser section.

Fig. 2 Seam welding stainless to stainless on Pratt & Whitney Aircraft J-57 jet engine transition duct assembly. Note simple fixture used.

The Sciaky Predetermined Electronic Counter Weld Control is the only control of this type that has been proved in service, and the first unit of this kind has now been in use nearly two years.

How It Works

The Sciaky Predetermined Electronic Counter Control counts the cycles of power line frequency which is governed by the U.S. Naval Observatory. In predetermined absolute numbers, cycles and impulses are simply counted by a Dekatron tube to control the duration of the various welder functions. The absolute consistency of the control eliminates the need for time-consuming periodical check-out or calibration. Plug-in feature permits easy unit replacement, or addition of other control functions if required.

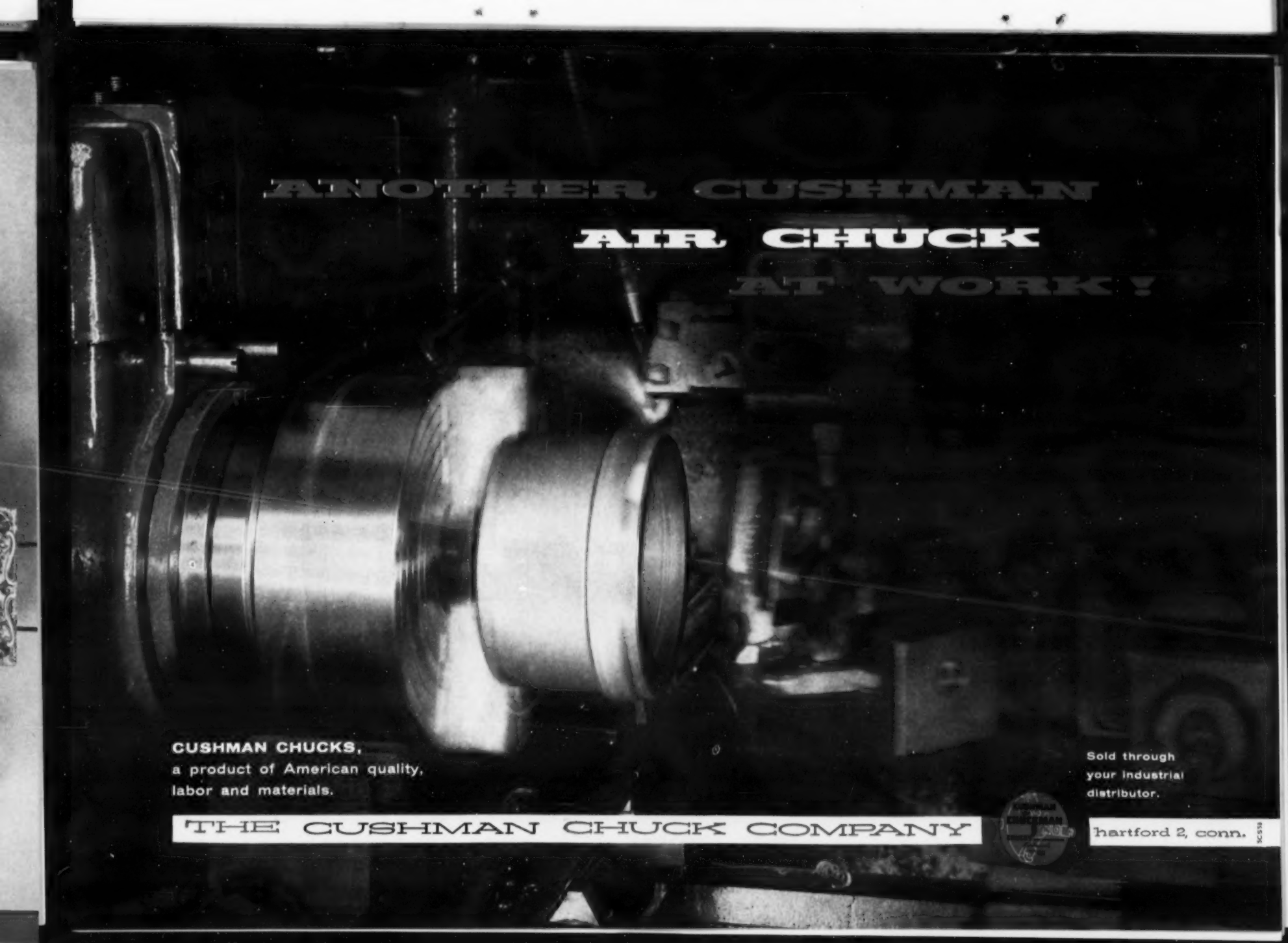
Operations Performed

Photos show typical Sciaky resistance welding applications on jet engine parts—Afterburners, Screech Screens, Engine Duct Assemblies, etc. Materials welded include Nickel Alloy, Nimonic and Stainless Steel.

Information Available

Case histories outlining the successful use of Sciaky Resistance Welding Techniques on jet engine components are available on request. Specific recommendations will be furnished on receipt of an outline of your requirements.

Write today, mentioning the information you would like to receive. There is no obligation. Sciaky Bros., Inc., 4953 W. 67th St., Chicago 38, Ill. POrtsmouth 7-5600. 62-C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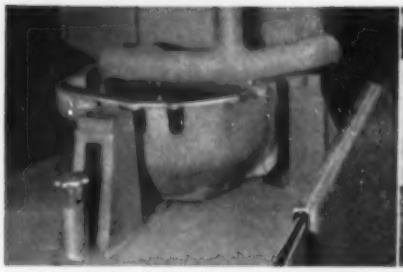
GRINDING METHODS

Discover new advantages in surface grinding!

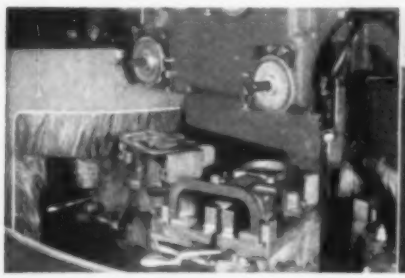
increasing wheel pressures speeds stock removal, continuous cutting action eliminates tooling headaches!



Saves two milling operations—Thin-walled grey iron castings formerly required two milling cuts to remove stock without excessive springing; now they are finish-ground from the rough, two sides in one operation, at the rate of 17.4 per hour. Stock removal is .070 in. per side.

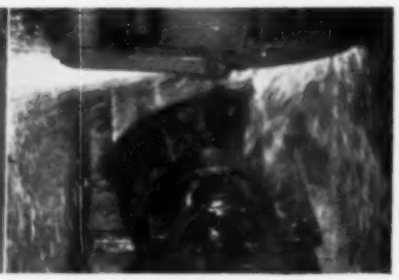
Grinding three times faster than planing—Switching from a planer to a face grinder increased production of cast steel brake bases 200 to 300 per cent. Surface finish is improved and accuracy limits are easily held. Reduced skill requirements made a sizable saving in direct costs.

Grinding costs 22¢ per piece less than milling—4140 drop-forged links are ground 30 pieces per load at 100 per hour, using a 40-hp spindle motor. Former production on a milling machine was 100 pieces every three hours at a cost of 31¢ each; cost by grinding is only 9¢ each.



Eliminates springing under milling cutter—Cylinder front covers are machined on a four-spindle grinder at the rate of 240 surfaces per hour. Rough, semi-finish, and finish cuts are taken on the engine face, pan face, and water pump body face with only a single pass through the machine. Continuous cutting action increases accuracy.

Doubles production of parts formerly milled—Production was increased from five parts an hour to twelve on a surface grinder. Diesel engine timing gear housings are rough-ground to within .010 in. on both sides and then finish-ground on the same machine. Seven castings are machined per load with greatly reduced setup time.



Grinding dies saves $3640 per year—Heavy forging dies, formerly machined on a planer, are refinished on a 100-hp surface grinder with appreciable savings in labor costs annually. Dies are made of tough nickle-chrome-molybdenum steel. Holding fixture permits grinding the bevel edges by tilting the die.

If you can visualize grinding jobs like these in your shop, you will probably find not one, but several, ways to reduce costs.

Take any flat surface. The most important question is whether a grinding wheel will give you stock removal. You already know it will improve accuracy and finish. If the part can be held on a magnetic chuck, fixture costs will be lower and tool costs can be reduced because you rule out heavy intermittent cuts, friction, and heat. Cutter breakage, sharpening time, and short tool life will no longer be cost bugaboos.

New advances in grinding wheels

The reason surface grinding now challenges other machining methods, and why more horsepower can be used to speed stock removal, is that improved bonding techniques help today's grinding wheels hold their grits better under heavy cuts—then release the grits when they get dull, letting the wheel break down. Automatic sizing can be used to compensate for wheel wear and eliminate hand checking of parts. You never have to stop the machine in the middle of an operation or change the wheel until it is worn out. Thus, you can use higher pressures per grit (Fig. 1) without loading the wheel, keeping it open and free-cutting.

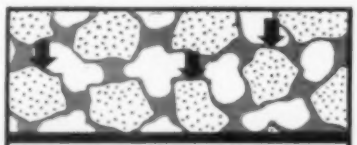


Fig. 1—Open-structure wheels, with high pressures per grit, increase stock removal.

Your open-structure wheels give you enough clearance between grits for removal of longer, thicker chips. Fig. 2 shows an actual chip obtained from a high-powered surface grinder. Note that the cutting action is similar to milling, only more and harder cutting edges are used to distribute the load and provide a smoother operation.

Many companies are designing new products for automatic assembly. Certainly, surface grinding offers many advantages by holding closer tolerances and minimizing skills needed to fit surfaces properly.

Fig. 2—Magnification of steel chips produced by a surface grinder.

WHAT JOBS ARE BEING SURFACE GROUND?

Let us send you this factual file of surface grinding case histories showing the wide variety of materials and parts being produced on a surface grinder. Ask for grinding "Setups" and address your letter to, or call:

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You learn a lot in a hundred years... especially in the hundred just passed

—the greatest century of technical progress the world has ever seen. Born as it was, on the brink of the era, the growing Bliss Company was in a position to make a number of contributions to pressed metal-working... the first inclinable press, for example, and the famous rolling key clutch, the toggle press principle, pneumatic clutches, these are some of the more important ones.

Proud? Of course we are—of these contributions and of the men who made them possible. For we've learned in our past century that: Any company, no matter what its size, is basically people... that a customer isn't a purchase order, but someone to whom we are responsible both now and in the future. This is part of what we mean when we say, "Bliss is more than a name... it's a guarantee."

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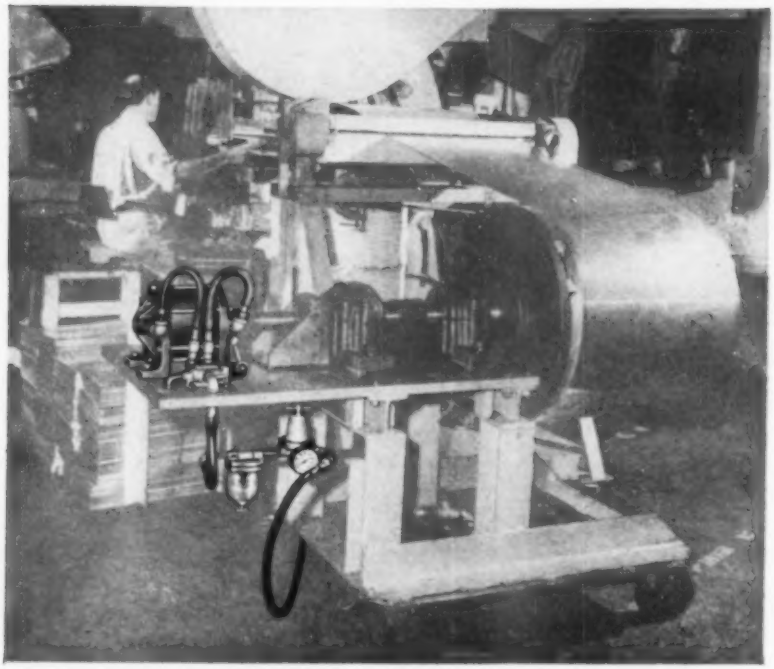
YOU CAN TAILOR AIR CONTROL UNITS FOR ANY JOB WITH STANDARD SCHRADER PRODUCTS



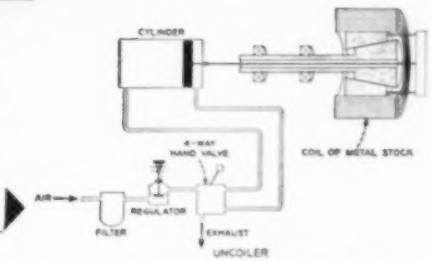
Every day more designers, more engineers are solving problems with air. They're planning air systems to hold, clamp, move, trip, feed, eject . . . from tiny parts to 3000-pound coils.

Air is versatile, economical, safe, fast. And when you select your components from Schrader, you choose from the most complete line of air products. Whenever you mechanize manual operations, or automate mechanized ones, investigate air. Schrader engineers are prepared to help you like we did here.

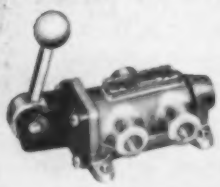
HERE'S AN INTERESTING SHOP PROBLEM SOLVED BY SCHRADER: How to strip steel from 3000-pound coils:

Radial jaws actuated by a Schrader air cylinder hold the coil firmly on an expanding mandrel. A 4-way valve and a pressure regulator govern the air power. Wherever uncoiler is needed it is plugged into an air line with quick-acting couplers. Opening the 4-way valve actuates the cylinder and the operator works freely at this machine. Just imagine the time and trouble, this one idea saves this company!

Here's the hook-up

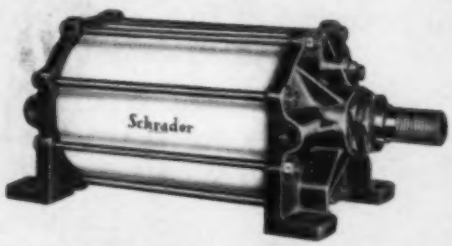


HERE ARE SOME OF THE SCHRADER PRODUCTS SELECTED FROM THE HUNDREDS OF SIZES AND TYPES:



Four-Way Hand Valve operates through a simple hand lever. Can also be operated automatically or with pedal.

Lub-air-ator: special 3-port unit that lubricates, regulates, filters air line. Easily adjusts pressure.



Double Acting Cylinder: is used here for its powerful two-direction stroke. For one way powered stroke, use single acting cylinder with integral spring return stroke.

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PRECISION ...Our Key to Your Quality

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EXTENSIVE FACILITIES of 45,000 square feet exclusively devoted to development and production of fine circular metal cutting tools. Come in to consult us on special problems—and to see our precision production methods.

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CIRCLE R REPRESENTATIVES in all key markets—specialists in metal cutting, backed by Factory Consultation Service developed through continuous research and experience since 1923.

SPECIAL TOOLS regularly developed to meet specific needs efficiently and economically for a wide variety of materials and cutting and slitting operations.

STANDARD PRODUCTS in the complete range of slitting saws for metal, copper, textile metallics, plastics, rubber, sandpaper, emery cloth, etc.; cut off saws, commutator slotting saws, jewelers' slotting saws; circular knives and rotary shear blades; Deep-Cut saws, Circoloy steel saws, HSS saws, solid and tipped tungsten carbide saws, combined drills and counter-sinks and center reamers.

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Circular
Saws
METAL SLITTING SAWS
COPPER SLITTING SAWS
SCREW SLOTTING SAWS
COMMUTATOR SLOTTING SAWS
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CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS
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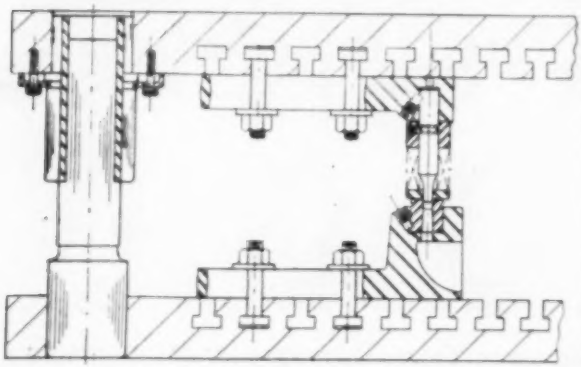
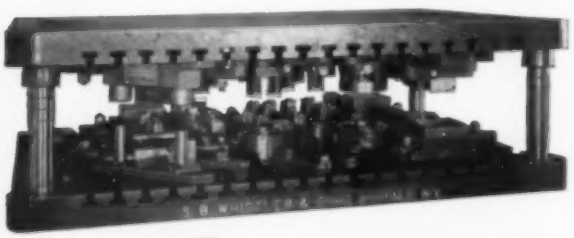
• Operate like a single purpose die • Easy to set-up and make changes • Interchangeable and re-usable parts always ready for a new job • Reduce die costs to a new low • Pierce holes in any desired arrangement of shapes and sizes • Precision piercing of materials to ¼" thick steel.



Above: Sectional drawing of a Whistler adjustable punch and die unit assembled in T-slot die set. **Below:** A completely assembled Whistler adjustable die ready for the press.



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HIGH SPEED STEEL BAND SAW

Cuts up to 10 times faster...with up to 30 times longer life

This is the new Starrett SAFE-FLEX® Band Saw — a *high speed steel* band saw that cuts up to 10 times faster, outlasts ordinary blades as much as 30 to 1. Engineered for higher speeds and heavier feeds to cut harder and tougher materials with ease and safety, it pays for itself over and over in lower cutting costs, longer tool life and substantial material savings.

Red-heat hardness even at temperatures up to 1100° F. keeps this new band hard and sharp. Graduated hardness gives it super-hard teeth and a super-tough back. Thinner section (.025″ to .042″) lets it cut faster with less power and less chip loss.

Your nearby Industrial Supply Distributor has this new Starrett SAFE-FLEX® High Speed Steel Band Saw in Regular, Skip-Tooth and Hook-Tooth types. Call him for quality products, dependable service — or write for complete information. Address Dept. C. The L. S. Starrett Company, Athol, Mass., U. S. A.

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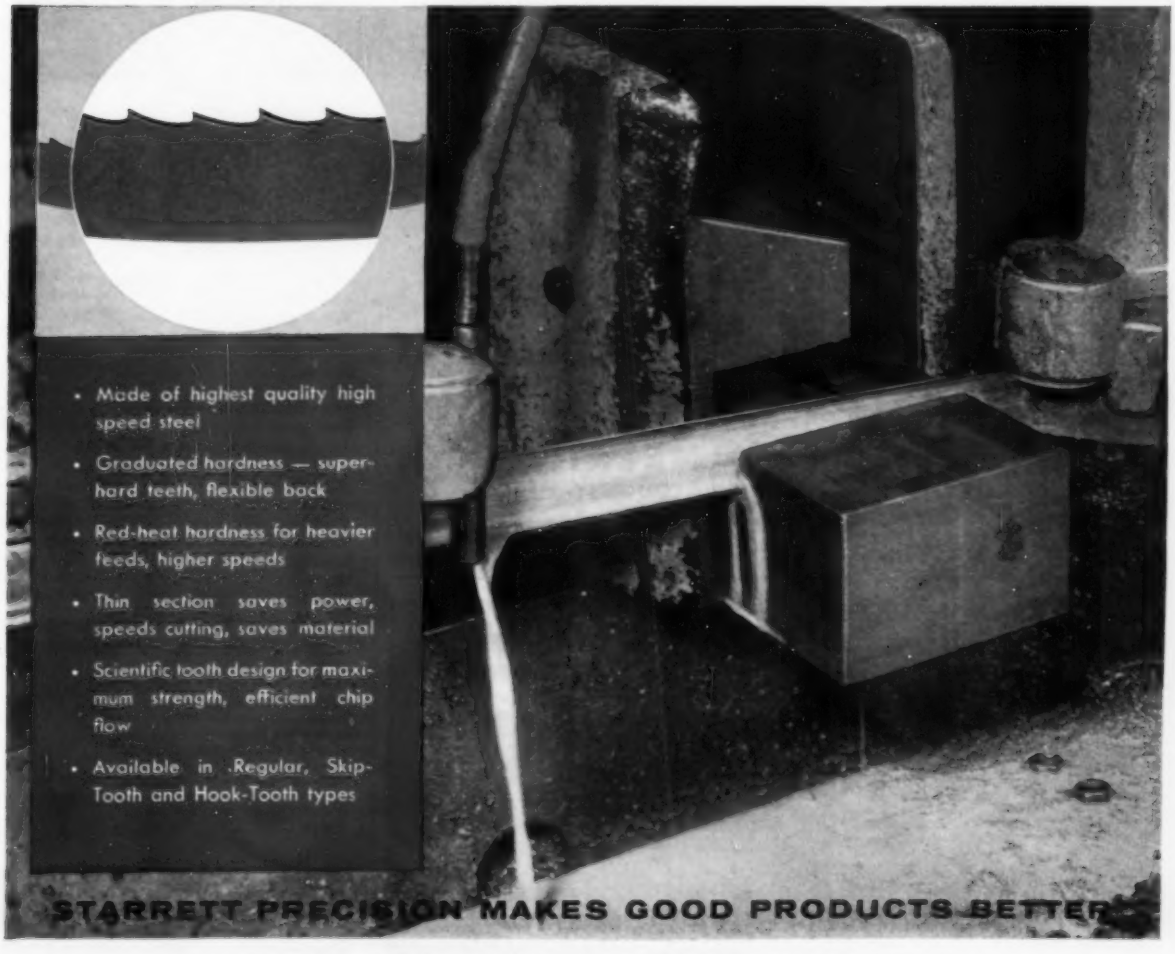
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ECONOMY TYPE 5200

Double End Automatic POINTING MACHINE

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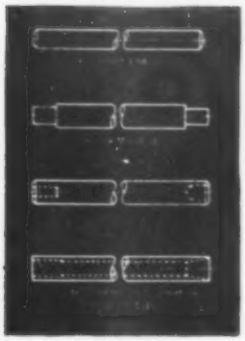
For POINTING, HOLLOW MILLING, DRILLING, and THREADING RODS and STUDS • for CHAMFERING INSIDE and OUTSIDE OF TUBES



Typical Operations Performed on TYPE 5200 Double End Automatic Pointing Machines

The Type 5200 Automatic Double End Machine performs operations for which it is suited on diameters of 1/4" through 1-1/2" and lengths 1-1/2" to 30".

Production rates up to 3600 pieces per hour with a stud hopper, easily adjusted for lengths and diameters are possible. For short lengths, an independent automatic hopper feed can be provided.

Spindle speeds and feed rates are infinitely variable within the ranges built into the machine. Feed rates and length of cut of each head are independently controlled. Lengths can be held to .001" per head.

The machine stops automatically, preventing damage to tools, in the event of part jamming. Simple push button operation clears machine to resume operation.

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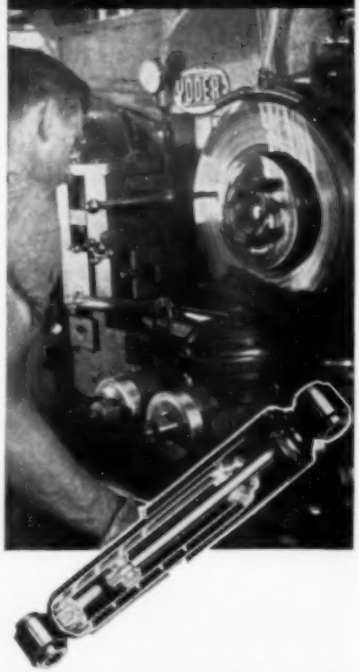

After 15 years of continuous operation the Yoder Type-M Electric-Resistance Weld Tube Mill shown here, is still producing precision tubing for the Monroe Auto Equipment Co., Monroe, Michigan. Yoder produced tubing is the basic component of the famous "Monro-Matic" shock absorber. Measuring 2 1/64" outside diameter (plus several other sizes) the tubing is made from 22 gauge strip in one continuous operation . . . it is automatically cold-roll formed, welded and cut to pre-determined lengths.

This typical installation of a Yoder tube mill exemplifies the accuracy, dependability and production economies of Yoder-made tubing. If your business requires pipe or tubing, ferrous or non-ferrous, in sizes from 1/4" to 26" diameters, there is a Yoder mill designed to produce it economically, efficiently and accurately.

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Check into the many cost-saving advantages of operating a Yoder pipe or tube mill . . . write for the fully-illustrated 88-page Yoder Tube Mill Book . . . it is yours for the asking.

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Automatically positions work pieces
for your Drilling . . . Tapping . . . Reaming
Milling . . . Pressing . . . Welding operations
Saves the costly time of hand feeding
Electrically controlled, rotary,
or linear work feeders are easily
installed, readily synchronized
with any machine cycle

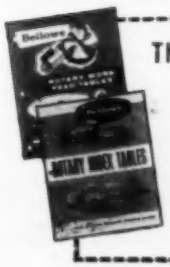
QUALITY CONTROL CAN BEGIN AT THE POINT-OF-OPERATION WHEN YOU FEED PARTS WITH BELLOWS WORK FEEDERS

You will have many more acceptable parts at Final Inspection if you examine work pieces at the point-of-operation. To give machine operators time for visual inspection, feed parts to tools with Bellows Work Feeders. The operator will then have time to load at one station, unload and examine a finished part while his machine continues to work. Not only will there be time for examination of the machined part but you will be able to use more of the machine's producing ability. The tool won't be standing idle while the operator loads and unloads.

Bellows Work Feeders are made in both rotary and linear type models; different units designed for high speed parts positioning where tolerances are not critical, or precision indexing types where close accuracy is required.

Air-Powered, electrically controlled, they are easily installed on standard machine tools, can be readily synchronized to work with the basic machine cycle.

To cut machining costs . . . keep the machine working while you load or unload a fixture.



These Bulletins give you the Facts

Write for Bulletins RT 1022 and RT 1326 for full specifications and application data on Bellows Work Feeders. Address Dept. AM-358, The Bellows Co., Akron 9, Ohio. In Canada, Bellows Pneumatic Devices of Canada, Ltd., Toronto 18, Ontario.

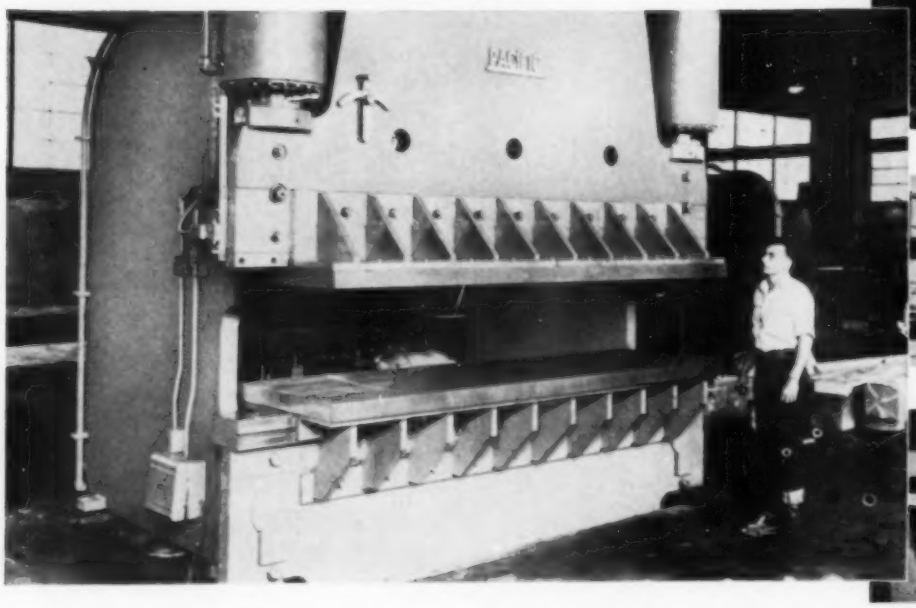
The Bellows Co.

DIVISION INTERNATIONAL BASIC ECONOMY CORPORATION

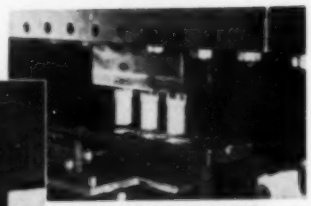
AKRON 9, OHIO

1030-B

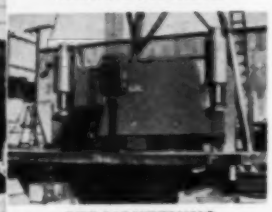
Pacific hydraulic press brake does more metal forming operations than a combination of conventional machines



FORMING

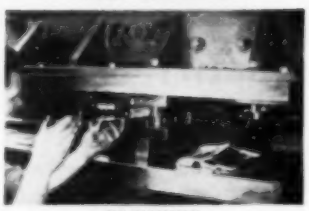


HEAVY PUNCHING



STRAIGHTENING

DEEP DRAWING



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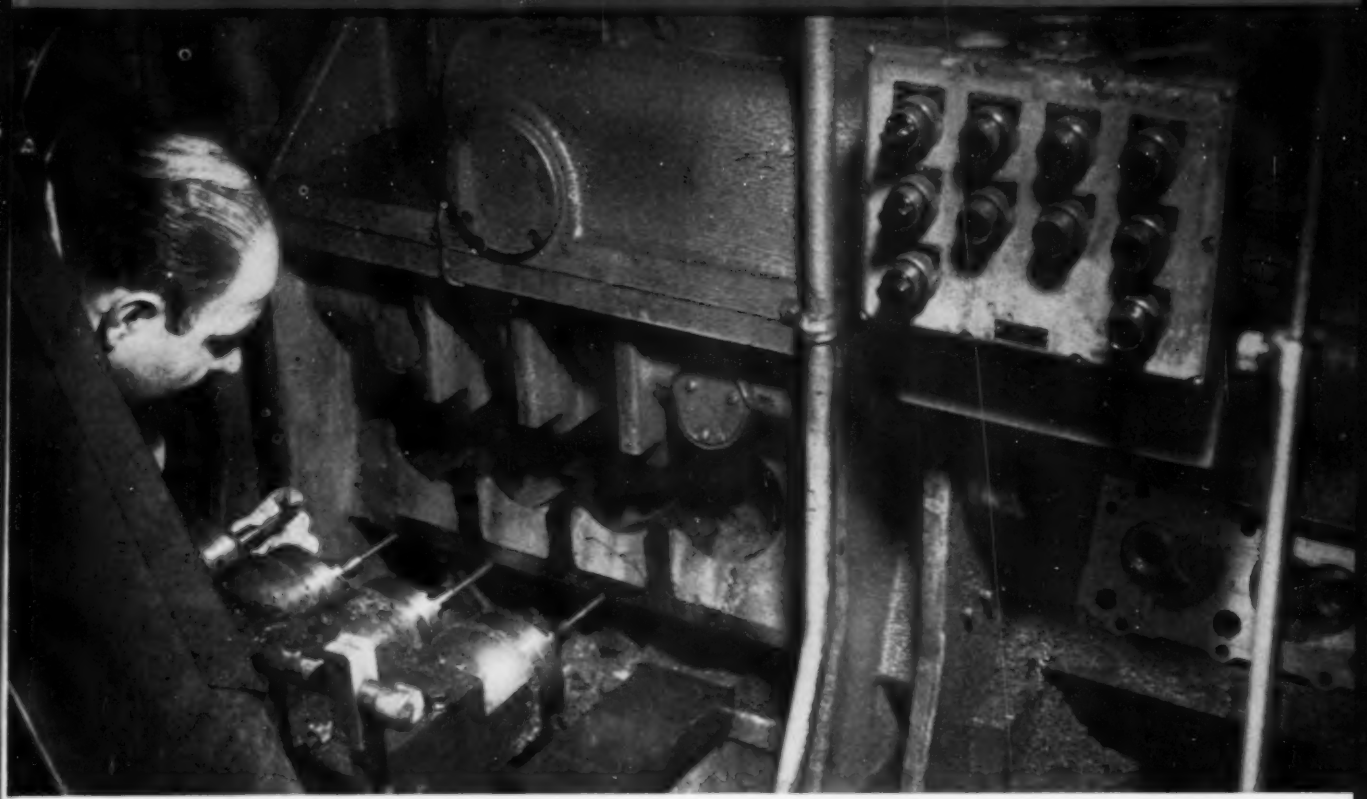
Chicago-Latrobe Carbide Bore Reamers help boost Rambler production

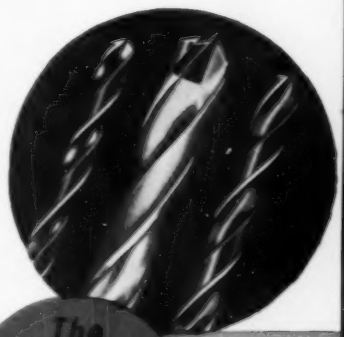


Reaming and chamfering in one trouble-free operation increases production on American Motors cylinder head line

Big news in the industry is the sales climb of American Motors' Rambler. At Rambler's Kenosha plant, the line is operating at capacity to meet demand.

Chicago-Latrobe Service Engineers work regularly with AM to get more and more production with greater precision into all their drilling and reaming operations. In the photo, four guide bushings are reamed and chamfered at one time—using Chicago-Latrobe Carbide Bore Reamers. This unusual setup is saving time . . . keeping vital parts moving.

C-L tools for difficult drilling and reaming jobs may answer some production problem in your plant. Ask a Chicago-Latrobe distributor to bring in a C-L Service Engineer. Regardless of the size of your operation, he's at your disposal without cost or obligation.



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FOR OPERATING PRESSURES UP TO 2000 psi

For years the Machine Tool Industry has been asking for a combination Temperature and Pressure Compensated Flow Control Valve to insure CONSTANT FEED RATES. Now for the first time it is available as a production unit at a reasonable price.

Check THESE EXCLUSIVE FEATURES that mean Optimum Tool Life and Better Work Finish:

☑ **TEMPERATURE COMPENSATED**
Constant feed rates all day long with same throttle setting because throttle automatically compensates for changes in oil temperature. The compensator mechanism is simple in design and durable.

☑ **PRESSURE COMPENSATED**
Constant feed rate throughout entire cycle because built-in pressure hydrostat automatically compensates for load changes.

☑ **SINGLE THROTTLE COMPLETE RANGE ADJUSTMENT**
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☑ **TAMPER-PROOF ADJUSTMENT**
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☑ **INTERCHANGEABLE**
This new valve replaces 12 previous models and it is interchangeable with all of them, also the drain connection is eliminated on the new valve to simplify piping.

☑ **GREATER ECONOMY**
No need to stock several valves for wide range of flow rates. Drain connection is eliminated, piping costs are reduced.

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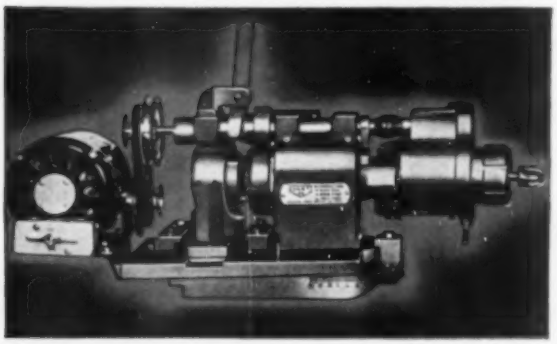
Precision CIRCULARITY GRINDING ATTACHMENT



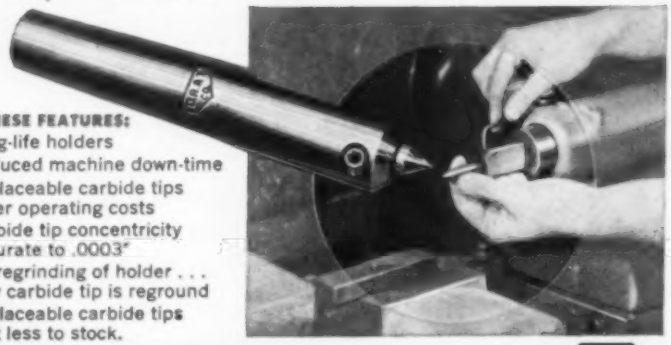
Simple, speedy set-ups on this accurate attachment permit fast and easy grinding of form relief, a combination of form and radial relief, tapered cylindrical and straight cylindrical.

Model 500 Circularity Grinding Attachment is faster—easier to handle—has positive control—greater adaptability—rugged construction—is engineered and built to provide the finest precision work.

You Can Grind Tools Like These On A

DETROIT REAMER CIRCULARITY GRINDING ATTACHMENT

Grip-Tip CENTERS–Replaceable Carbide Tips



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3. Replaceable carbide tips lower operating costs
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If it's a "hard-to-figure-how", metal-cutting job, — there is a PORTER CUTTER that can handle it for you, with amazing speed, and lowest possible cost. In the versatile PORTER line there are 108 different hand-powered cutters, each one designed to do a particular job, or jobs — to cut some type or size or shape of metal fast and cheap, including BOLTS, RODS, SCREWS, RIVETS, WIRE, CHAIN, SOFT, MEDIUM AND HARD METALS, STEEL STRAPPING, and many others. These rugged cutters exert up to 20,000 pounds cutting pressure — make hard work easy, cut labor costs as much as 97%! Want profitable proof? Write for the PORTER catalog.

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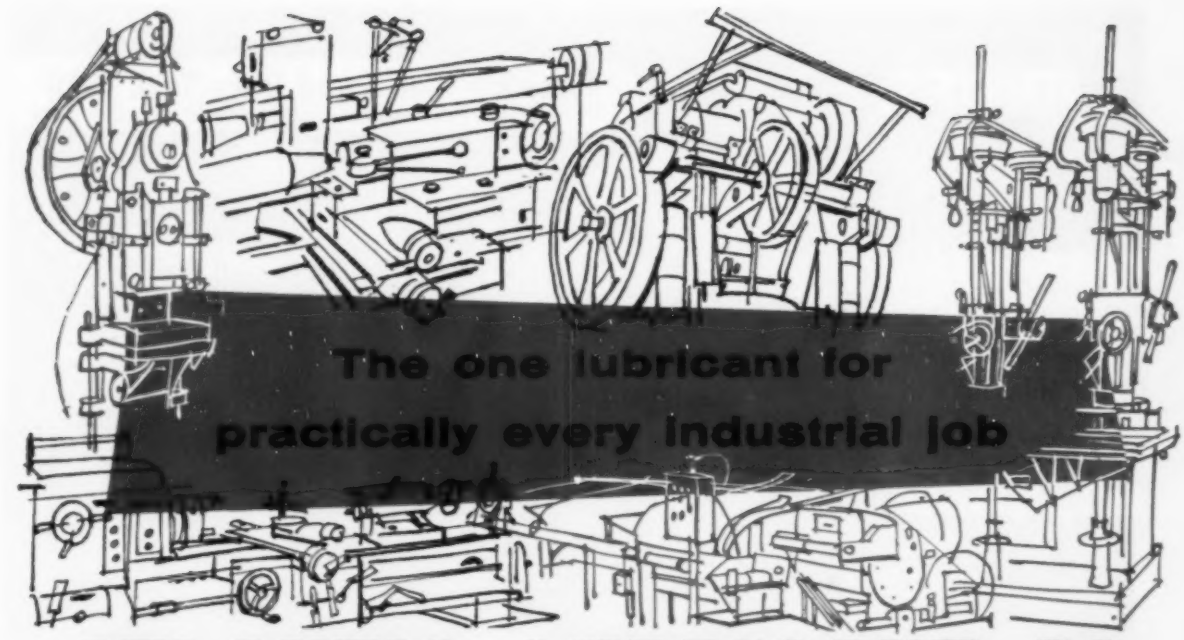

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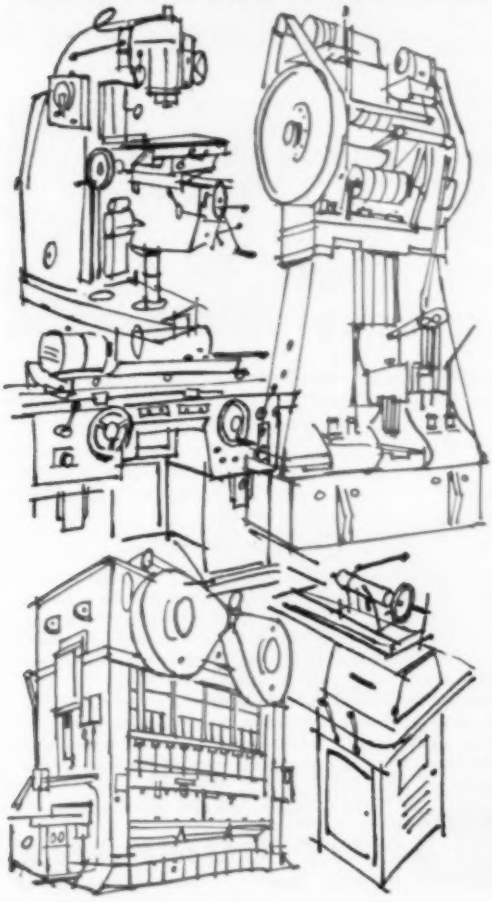
Performs on all types of grease-lubricated machinery • Cuts cost • Reduces lubricating errors



Atlantic Lubricant 54—an outstanding multi-purpose lubricant—assures·

- **Wider application**—almost universal application to grease-lubricated equipment in plants of all sizes
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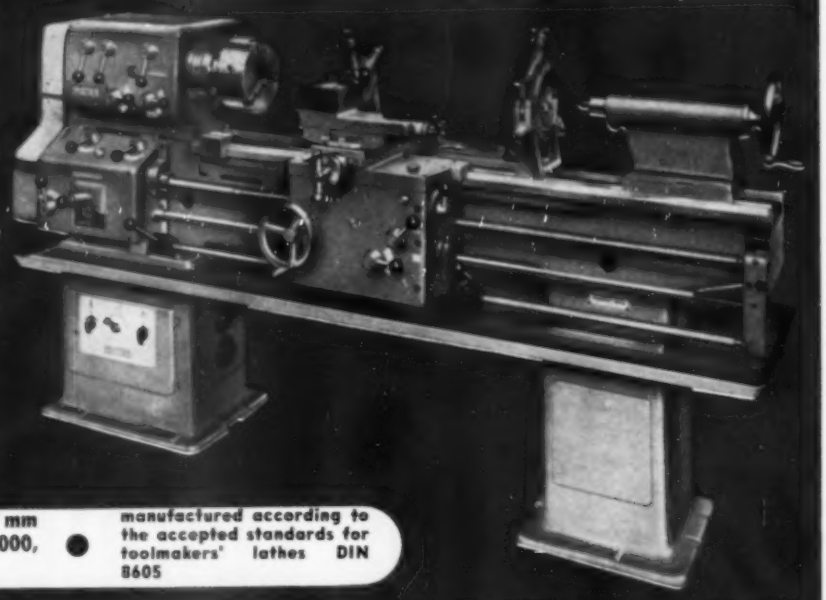

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Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.
Let our engineer study your keyseating problems.

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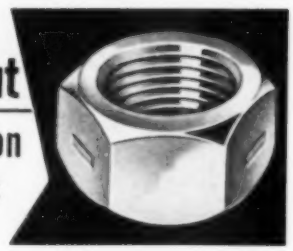
NEW Centerlock Nut



saves production time...speeds application

Here is a new low cost lock nut that can be applied from either end, double chamfered, with the locking feature in the center. The greater speed in application of these Centerlock Nuts can make definite savings in production time and provide low cost fastening. Ideal for customer assembled products.

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NATIONAL ELECTRIC

solves tough production problem of welding air-suspension brackets for 1958 cars

The new air suspension systems introduced on some 1958 cars, create not only a super-smooth ride for passengers . . . but many production problems for manufacturers. To help lick one of these problems . . . National Electric designed and built two new multi-station arc welders that perform 2 important operations on the structural members of the new systems.

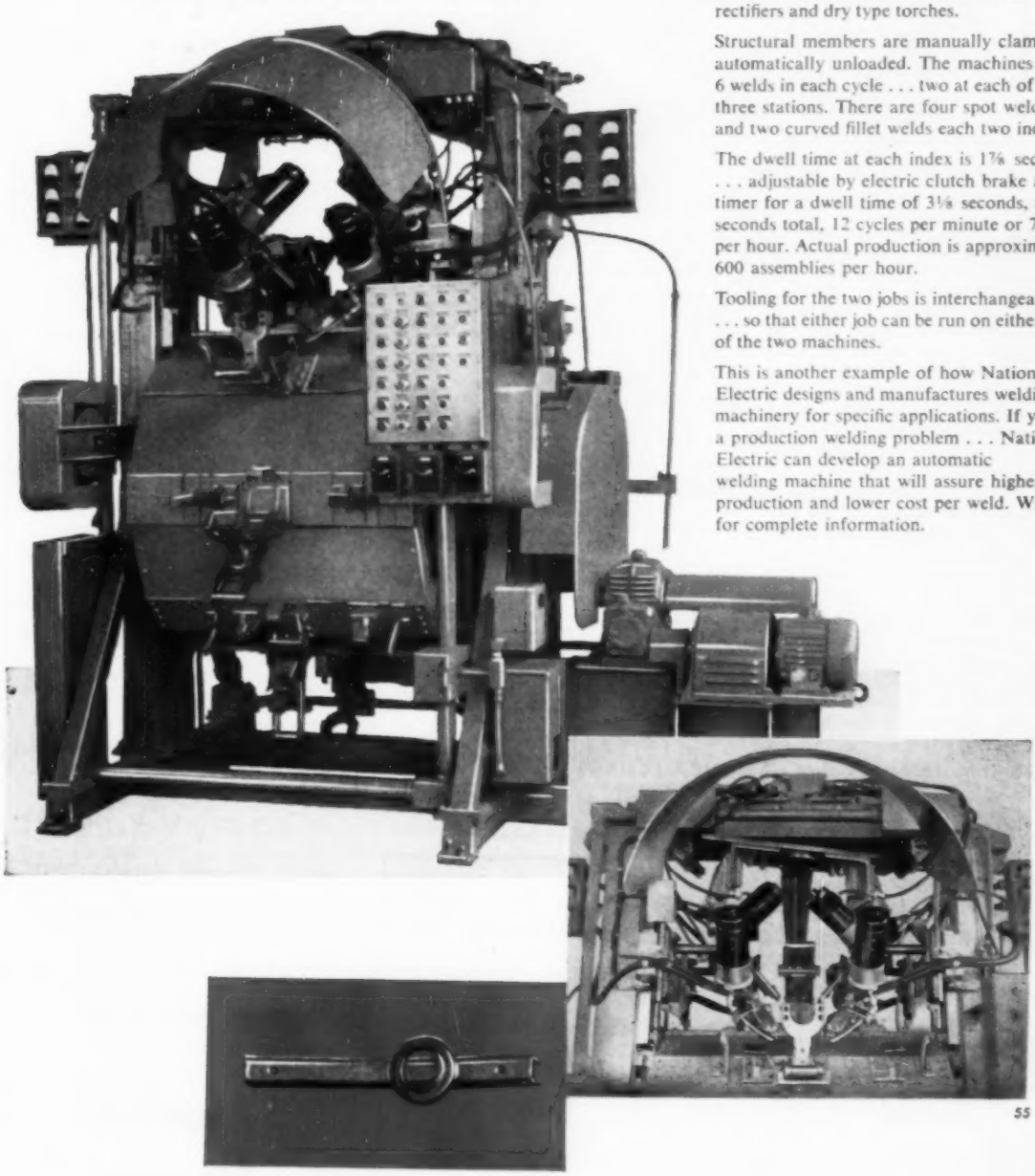
These 6-head, CO_2 arc welders incorporate a drum feed, 8-station Geneva Index, with 800 amp. rectifiers and dry type torches.

Structural members are manually clamped and automatically unloaded. The machines complete 6 welds in each cycle . . . two at each of three stations. There are four spot welds . . . and two curved fillet welds each two inches long.

The dwell time at each index is 1⅞ seconds . . . adjustable by electric clutch brake and timer for a dwell time of 3⅛ seconds, five seconds total, 12 cycles per minute or 720 cycles per hour. Actual production is approximately 600 assemblies per hour.

Tooling for the two jobs is interchangeable . . . so that either job can be run on either of the two machines.

This is another example of how National Electric designs and manufactures welding machinery for specific applications. If you have a production welding problem . . . National Electric can develop an automatic welding machine that will assure higher production and lower cost per weld. Write for complete information.



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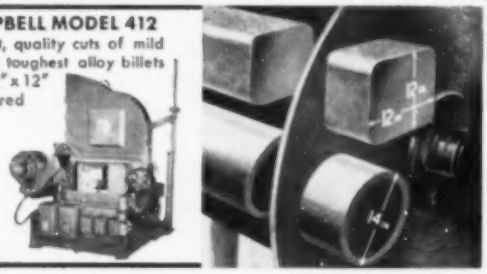
Abrasive Cutting Machines

Abrasive Cutting Know-How

Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation

CAMPBELL MODEL 412
For fast, quality cuts of mild steel or toughest alloy billets up to 12" x 12" as pictured



Users of Campbell Abrasive Cutting Machines get Tremendous Savings with Fast, Accurate, Quality Cuts of Mild Steel or Toughest Alloys

Write us and we will gladly send you helpful information on the working capacities of the 16 models of CAMPBELL Machines and the CAMPBELL Operating Features that explain the outstanding performance of these machines in cutting a wide variety of shapes and sizes of stock—channels...bars and tubing from the smallest to 14" diameter ...plate up to 4" thick and 20 feet long ...billets up to 12" x 12".

CAMPBELL Machine performance is well illustrated by the **Model 412** pictured above. This machine cuts through 12" x 12" billets of mild steel or toughest alloys (even titanium) in the almost unbelievable time of 6 to 10 seconds per square inch...*with quality cuts.*

Here are some of the operating features that account for comparable speed and quality of cuts by CAMPBELL'S 10 high speed production models...two of them fully automatic for highest production.

Oscillation of the Cutting Wheel to maintain cutting speeds and greatly lengthen wheel life is prescribed by CAMPBELL for all solids cuts over 2" in diameter.

Wet Cutting gives maximum assurance of Quality Cuts.

Ample Power, essential to good performance, is supplied for the Model 412 by a 40 HP motor.

Sound Work Holders—essential to accuracy.

For greatest abrasive cutting accuracy, CAMPBELL provides two oscillating machines that rotate the work—round bars or tubing from 3" to 14" diameter.

For further information write for the illustrated Bulletin DH-460-B

ACCO

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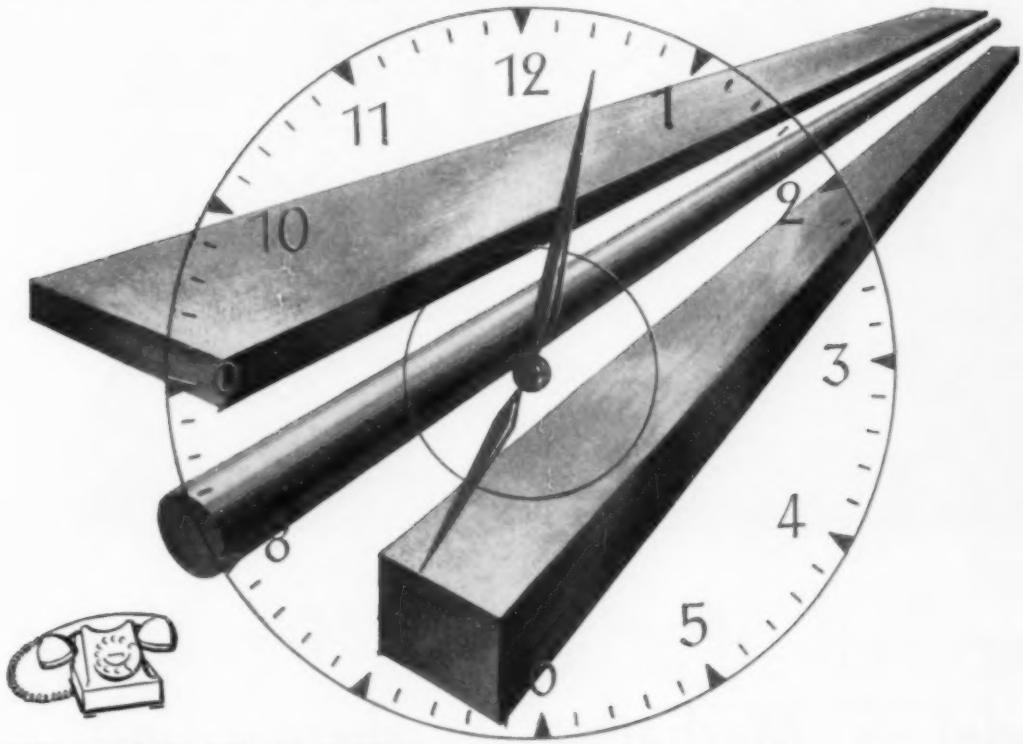
Firth Sterling ...

PIONEER IN POWDER AND MOLTEN METALLURGY



HOW FAST do you need the toughest oil-hardening tool and die steel ever made?

INVARO is available—for fast delivery—from Firth Sterling warehouse and distributor stocks of drill rod and ground flat stocks in all practical sizes. It offers tool and die makers consistent uniformity, better hardenability and greater safety in hardening—does a better job in a broad range of applications.

And the INVARO "Twins"—ground flat stock and drill rod—may be heat treated in the same furnace at the same time, exhibiting the same minimum dimensional changes. The resulting savings in time and production can be substantial. For further information, write for free technical bulletin.

INVARO oil-hardening tool and die steel is just one of the many types of electric furnace quality tool steels produced by Firth Sterling. These high quality tool steels are the result of Firth Sterling's continued research and development to provide specialty steels for use in the important tool and die industry.

* * *

If you have a metallurgical problem, powder or molten, we have the answer for it. Please let us hear from you. Firth Sterling, Inc., Dept. 91C, 3113 Forbes St., Pittsburgh 30, Pa. Offices and warehouses in principal cities.

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FIRTH STERLING TRADE MARK

Special *Two Way* Baush Features Model "S" Mechanical Leadscrew Unit...

in machine designed to end-mill and tap angular spark plug holes in cylinder head.

Speeding production of cylinder heads for a large motor producer this Baush machine completes 40 cylinder heads every hour. Production men are finding that Model "S" Mechanical Leadscrew units cut spoilage of parts with steady, clean cutting, as well as increasing production through less downtime and quicker starting.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

SPECIFICATIONS:

Welded steel base of this machine has chip conveyor running through it. At the left is the angular Model "S" Mechanical Leadscrew Unit which has a 4-spindle fixed center head arranged to end-mill holes.

At the right is a stationary angular Tapper with 4-spindle individual leadscrew fixed center head for tapping spark plug holes. This four position permanent-type fixture is hydraulically operated, electrically interlocked, and fixture hydraulically clamps part in position.

Full Trabon Lubrication system is used, with Mist Lubrication for tapping. The four motors and electrical controls are to J.I.C. standards.

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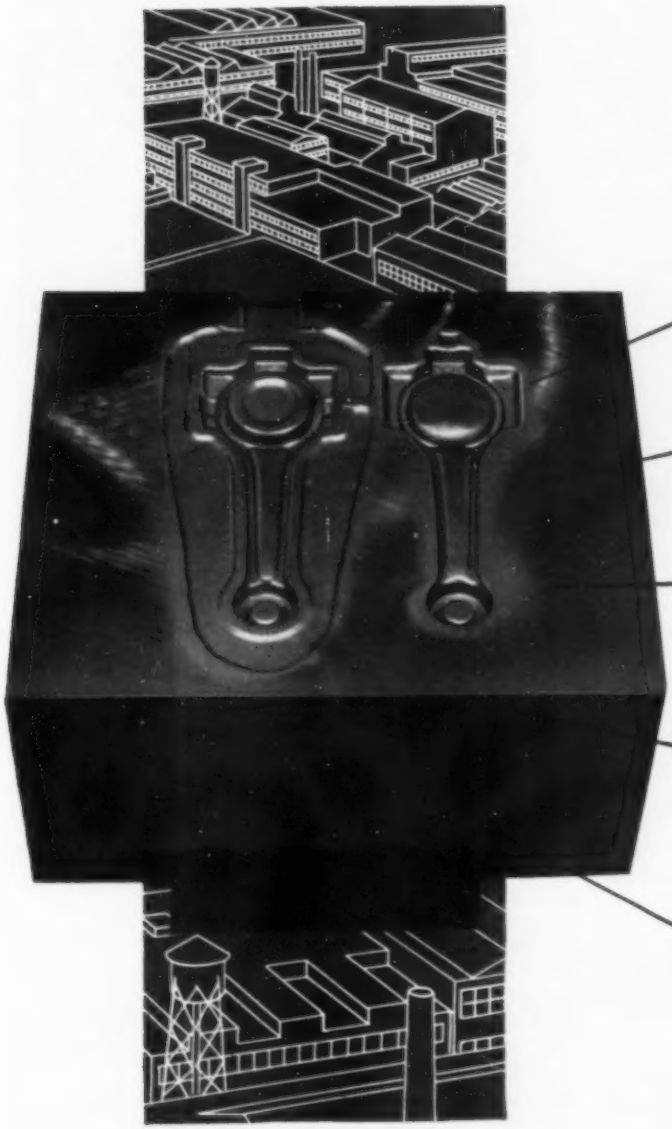
...somewhere this forging die is making history!



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17" lathe: 54" and 78" centers, 28" swing in gap; 15" lathe: 30" and 48" centers, 24" swing in gap; 13" lathe: 24" and 36" centers, 18" swing in gap.

SPINDLE CAPACITIES

Lathe	17"	15"	13"
Thru-Hole	3-1/16"	2-1/16"	1-9/16"
Nose Taper Key Drive	L-2	L-1	L-0

BEARINGS

Lathe	17"	15"	13"
Front Spindle Bearing O.D.	7-1/2"	5-1/2"	4"
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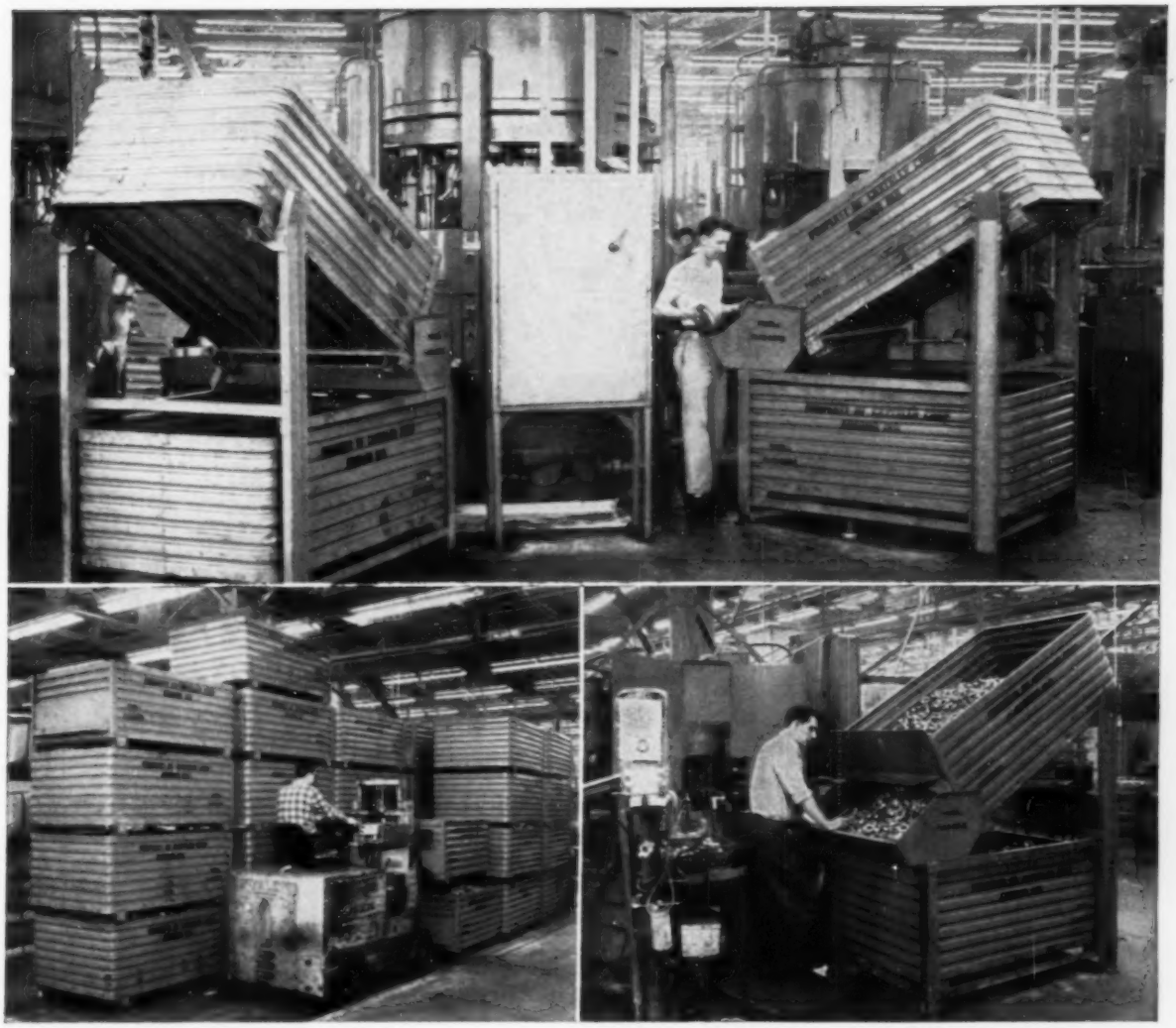

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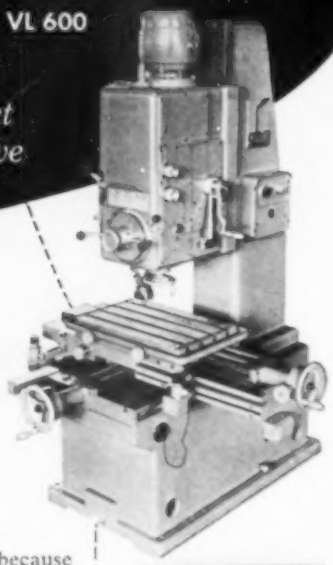

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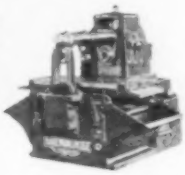

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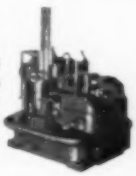

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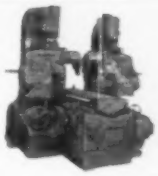

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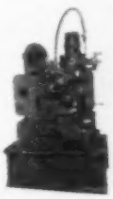

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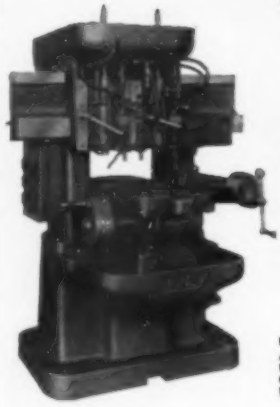

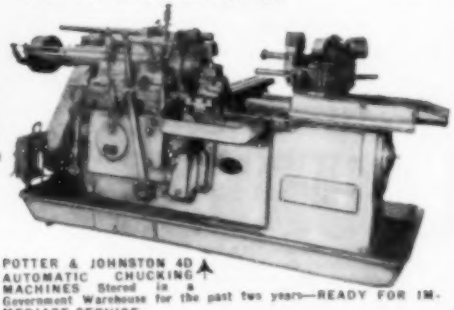

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Model 4D Potter & Johnston high speed automatic turret lathe, hard ways, Timken bearing spindle

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3¼" No. 5 Defiance horizontal boring, milling and drilling machine

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10" x 40" x 98" centers Norton Type "C" Cylindrical Grinder, two gaps, swing 40" and 29" in gaps, mechanical feed, late type.

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No. 21 Browne & Sharpe Automatic, m.d.
No. 33 Simplex Production, m.d.
No. 33H Sundstrand Trimplex Rigidmill, m.d.
No. 3A Sundstrand Plain Automatic Rigidmill, m.d.
24" Cincinnati Duplex Automatic, m.d.
48"x16' Newton Slab Miller, m.d.
54"x30"x16' Ingersoll Slab Miller, m.d.
Model 1482 Kearney & Trecker Simplex, m.d.
Model 1484 Kearney & Trecker Simplex, m.d., Production
No. 12 Brown & Sharpe Plain Horizontal, m.d.
3-24" Cincinnati Plain Hydromatic, m.d. in base
3-36" Cincinnati Duplex Hydromatic, m.d. in base
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Model 33-1536 Sundstrand Simplex Fluid Screw Type Rigidmill, m.d.
No. 54-36 Cincinnati Semi-Special Plain Hydromatic tracer control
28"x144" Cincinnati Plain Hydromatic, m.d., late
56-96 Cincinnati Plain Hydromatic, m.d. in base, 1946
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No. 3G.S. Hendey Plain, m.d.
No. 3H Kearney & Trecker, 1945
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30" widened to 36"x30"x8' Gray, belt drive
36"x36"x8' Cincinnati, m.d., 2 heads on rail
36"x36"x10' Cincinnati Openside, D.C. reversing m.d.
36"x36"x12' Betts, m.d., 3 heads
36"x36"x12' G. A. Gray, 2 heads
36"x36"x18' table Cincinnati Double Housing, m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' G.A. Gray Extra Heavy, belt, 2 heads on rail
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48"x48"x18' Niles-Bement-Pond, 2 heads, belt
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100 ton Chambersburg, hydraulic
Type 8750 Hennifin Hydraulic Straightening, m.d.
Model H Cleveland O.B.I. Punch Press, belt drive

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No. 12B Pratt & Whitney Model 1803, 2 spindle, 1944
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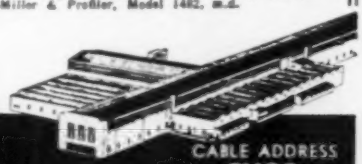

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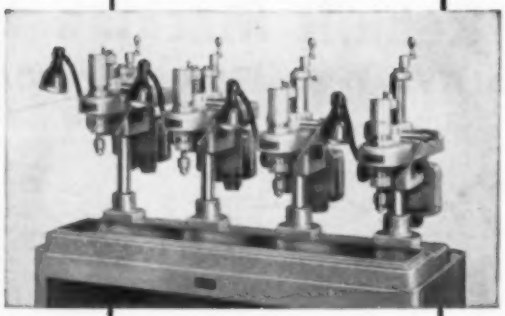

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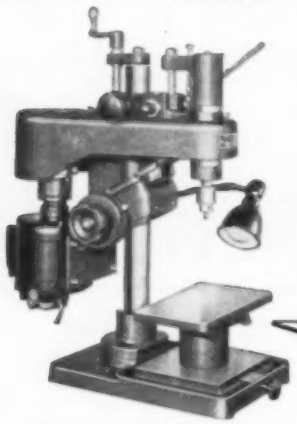

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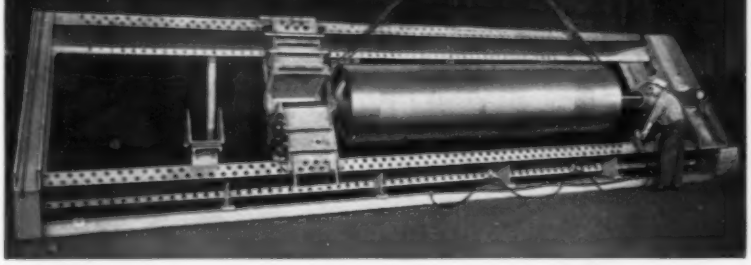

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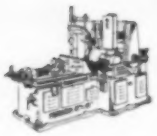

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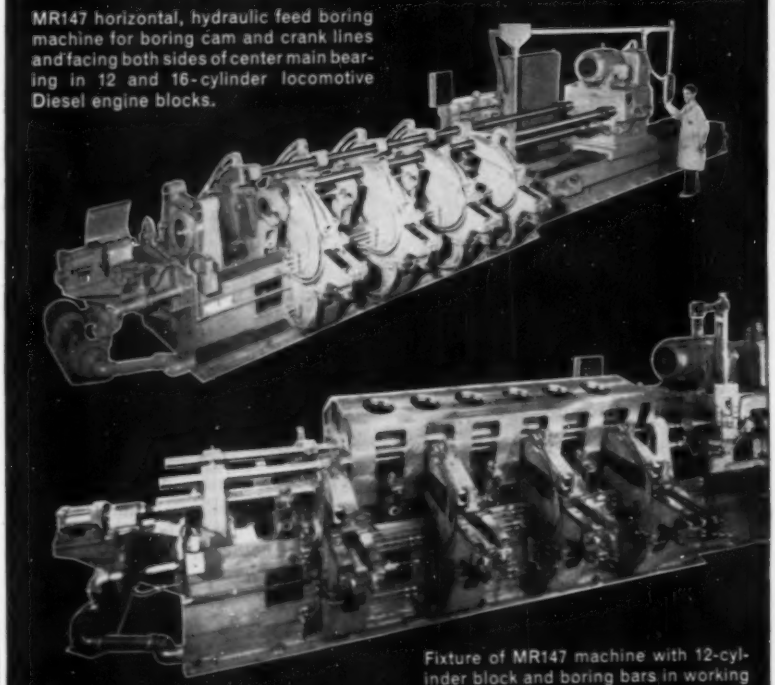
MOLINE

MR147 horizontal, hydraulic feed boring machine for boring cam and crank lines and facing both sides of center main bearing in 12 and 16-cylinder locomotive Diesel engine blocks.



Fixture of MR147 machine with 12-cylinder block and boring bars in working position. Cam bars run in hydraulic powered bushings which are retracted when loading fixture.

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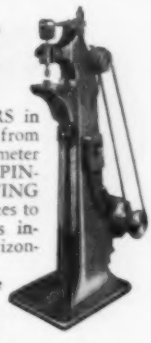

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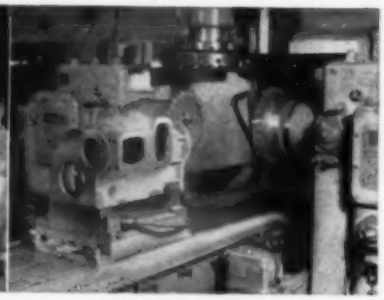

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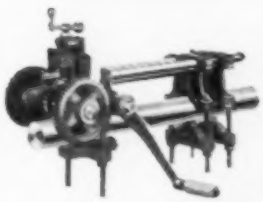

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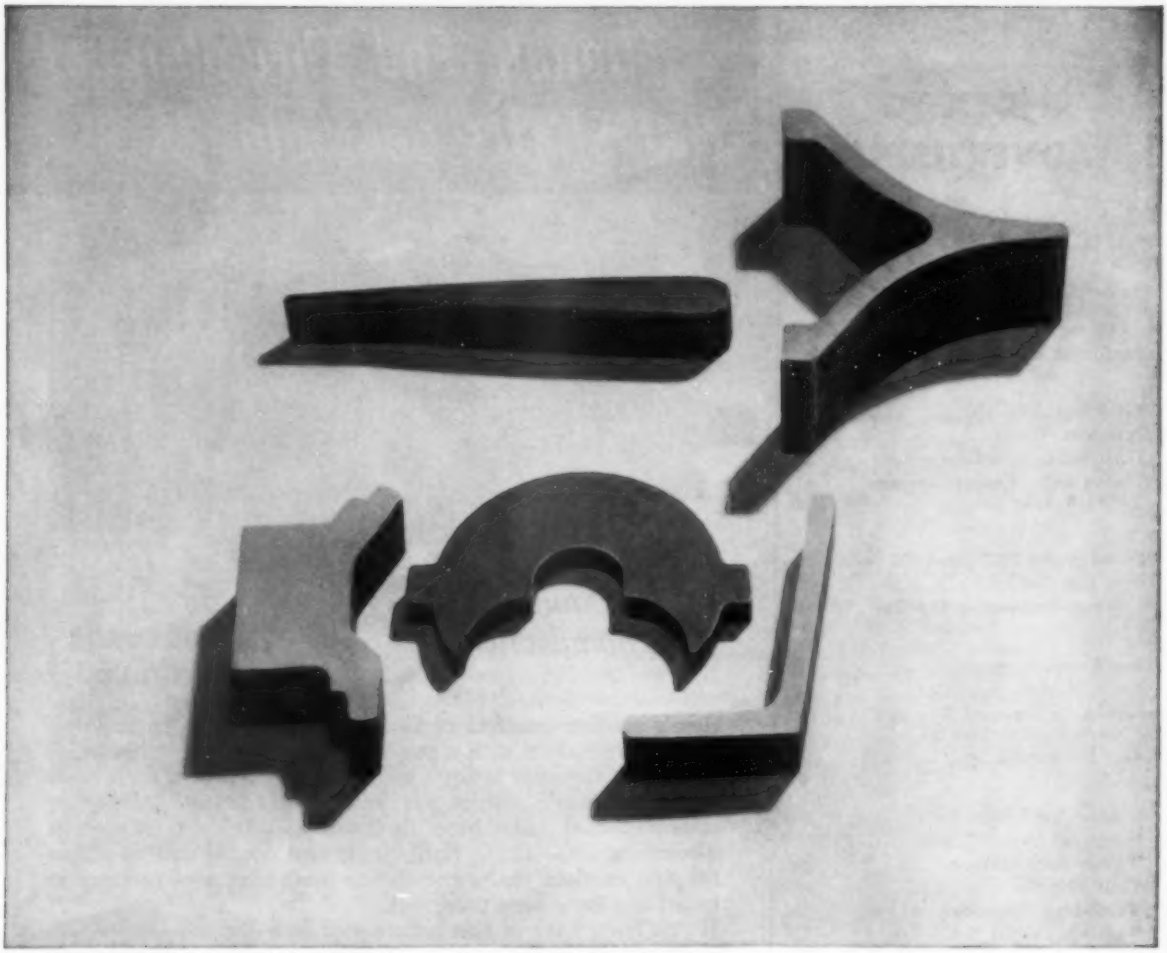

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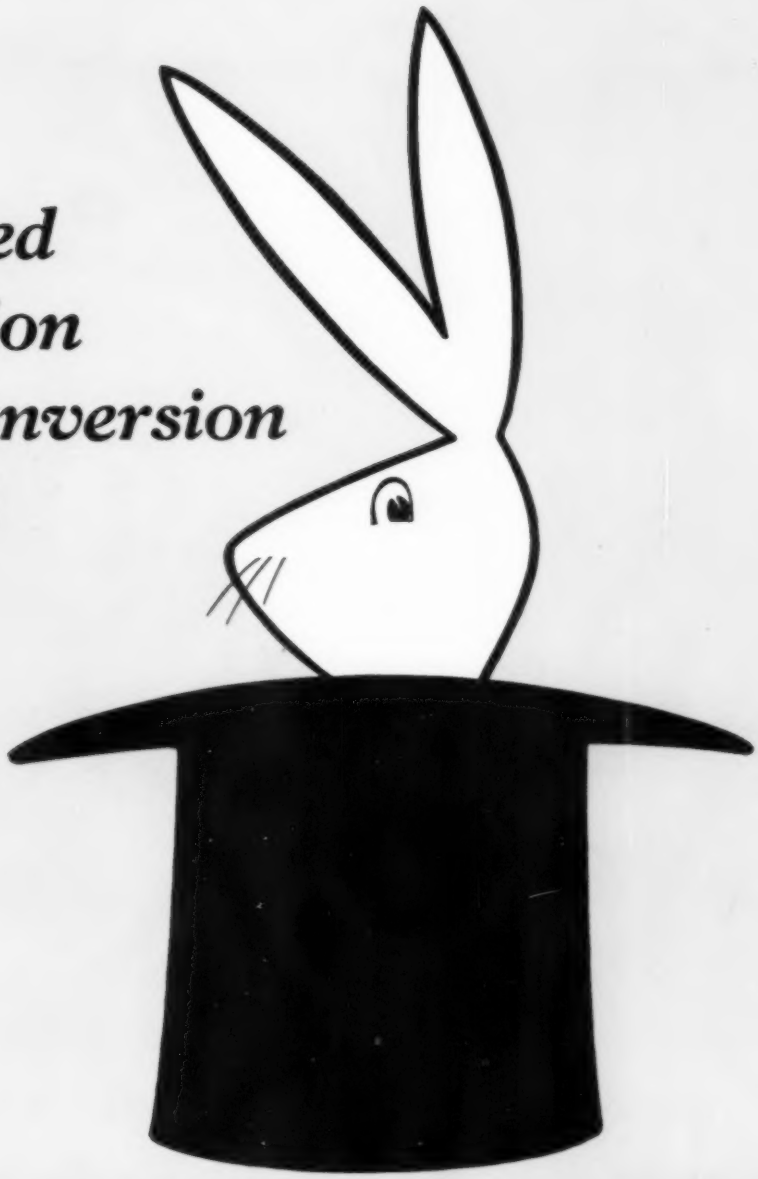

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